FIII/T136

FAO Fisheries Technical Paper No. 136 FIII/T136
Difficult Coasts

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Small Harbours and Landing Places on Difficult Coasts

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
ROME, 1975

SMALL HARBOURS AND LANDING PLACES ON DIFFICULT COASTS

An identification of some problems encountered in the establishment of small fishery harbours and landing places on difficult coasts, with suggestions for their solution

Report based on discussion at an Expert Group Meeting held in Department of Fisheries, FAO, Rome, July 1970, and on subsequent informal meetings and follow-up activities conducted within FAO and other Member Government Agencies

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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, December 1974

PREPARATION OF THIS PAPER

This is the second in a series of engineering reports based on study groups organized by the Fishery Harbour Section of the Department of Fisheries of the Food and Agriculture Organization of the United Nations, to consider problems met with in the development of the fishery industries of our Member Nations.

The problem considered in this report is the widespread one of providing small harbours and landing centres on those coastlines which lie adjacent to rich fishing grounds, but which are extremely hazardous for the fishery operation, and present many difficulties for the siting and design of suitable landing facilities.

FRONTISPIECE

Photo No. I One difficult coast location seeking a solution

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Cover Design: Sketch by Signorina A. Barcali from photograph of Malinbeg Project,
Commissioners of Public Works in Ireland.
Engineer-in-charge: Mr. G.D. Jackson, B.A., B.A.I., M.I.C.E., C.Eng., F.IEI.

PREFACE

In the expansion of the developing world's fishery industry during the last 20 years, much emphasis has been put on the mechanization of the fishing vessel. Little thought and much less effort has been given to the corresponding development of landing places and other essential supporting facilities to serve these new ranges of vessels. The result in many cases has been stultification of the fishery effort, with little or no increase in the economic return from the otherwise improved fishing operations. Much needs to be done to remedy this very unsatisfactory position.

A number of the countries principally concerned, unfortunately, have coast conditions which preclude the ready provision of fishery landing places either because of surf conditions or for reason of continuing or expected geomorphological and/or sedimentary changes.

While no elixir is available as an immediate "cure-all", much can be done to improve the lot of the fishery in many of these varying circumstances. A satisfactory result might be achieved in a number of different fields, but in the present state of engineering most of these would require further study and experiment before any solution could be recommended for general adoption.

The programme of work involved is too extensive to permit its implementation by one Organization such as the Food and Agriculture Organization with its limited budget and very limited civil engineering staff and facilities. It would appear that the principal FAO input should be in the role of coordinator and assessor, to further the development work being carried out by the number of other agencies and organizations.

While the principal purpose of this report is an attempt to define an early programme of work which could be commenced with the very limited funds at our disposal, it is also intended as a means of introducing the subject of the provision of landing places on difficult coasts to those Member Governments and their agencies who might have a special interest in the subject, and who could provide at least some of the facilities and funds for an early investigation of any of the problems encountered.

Areas where benefit would accrue from such a programme of work would include India (especially on the East Coast, e.g. Andra Pradesh and Tamil Nadu States), Malaysia (the whole East Coast), West Pakistan (satellite ports for Karachi fishery port and sites on the Mekran Coast), Indonesia (North and South coasts of Java), certain West African locations such as Ghana, Dahomey, Togo, Nigeria, Ivory Coast, Senegal, and in Latin America,Peru, Ecuador, Guatemala, Costa Rica and Mexico. It will be seen that this partial list comprises quite a large sector of the world's fishery developing nations.

A programme for a number of years' investigation and development is envisaged, with continuous active participation by at least three or more national bilateral aid agencies to make an effective initial impact on this difficult and more or less universal problem.

To assist the Organization in identifying the problems associated with the development of small fishery harbours and landing centres on difficult coasts, a preliminary meeting of experts was held at FAO, Rome, in July 1970. Since then there have been some follow-up activities; this paper summarizes the discussions and the early resulting activity.

The Terms of Reference for the meeting were:

(i) to identify the major problems involved in the development of small to intermediate harbours on coastlines with difficult conditions;

(ii) to recommend the most suitable means of determining the extent of the problems identified, and

(iii) to suggest means of implementation of study investigations or associated site works and exercises;

(iv) to prepare some preliminary programmes of work and guidelines, with cost estimates for the implementation of proposed projects.

Three expert Consultants were invited to take part in the Meeting:

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The FAO Department of Fisheries was represented by Mr. W.J. Guckian (Civil Engineer) then Chief, Fishery Harbours Section, and, during sessions relating to vessel developments, also by Mr. P. Gurtner (Naval Architect), then Chief, Fishing Vessels and Engineering Branch, and Mr. Øvind Gulbrandsen (Naval Architect), Fishing Vessels Section.

Professor Bruun, who at the time was a specialist consultant on Coastal Engineering matters to the FAO/UNDP Fishery Harbours Project in India, attended as a specialist consultant to that Project.

1. INTRODUCTION

In many parts of the world, the existing or potential inshore fishing grounds are in proximity to coastlines which present tremendous difficulties in the landing and embarcation of the vessels used in this type of local fishery operations which, it has also been estimated, take up about 90 % of the food fish landings in developing countries.

The purpose of this preliminary study, as indicated in the Terms of Reference (page 1) is to identify and define some of these difficulties which beset the fleets, to set down lines of investigation for their amelioration, and to allocate potential work programmes for their solution in at least those circumstances where economic improvements may be possible.

Since there would anyhow be capital cost limitations for most developments associated with near water fishing, it has been assumed at the outset that very extensive facilities could not be countenanced and that the craft concerned would range from the various existing kinds of small beach boat, motorized and sail, and canoes, up to the more sophisticated mechanized vessel of about 30 to 40 tons displacement.

Since the problems met with are world-wide in their distribution, no attempt has been made in this preliminary study to indicate solutions related to specific areas. Reference is made to such areas only where they illustrate general principles or where they offer special facilities or advantages for the study of particular aspects of the general problem.

2. FUNCTIONS OF THE SMALL FISHERY HARBOUR OR LANDING PLACE

Before studying the problems posed by difficult coasts, it should be recognized that fishery harbours and landing places provide for a number of different related activities, not all of which are, of course, applicable to any project or scheme. A particular location could stand in need of facilities for all or any of the following activities:

(i) launching or otherwise putting boats into the water;

(ii) getting boats through shore or shallow water difficulties (rocks, bars, surf, strong currents, etc.) into deep water and back again to safety in basins, or removing them and their catches ashore;

(iii) providing safe anchorage or berthage for boats afloat;

(iv) handling of catches from fishing boat to shore or to larger craft (e.g., carrier vessels or rafts on the fishing grounds or just offshore);

(v) servicing boats and crews - loading gear, fuel, water, ice and supplies, etc.;

(vi) processing and product-handling ashore;

(vii) maintenance and repair of boats and equipment at anchorage, quayside or ashore.

These activities present different problems for various types and sizes of boats. In examining the potential of a particular site, it is therefore an essential preliminary to determine two factors.

(a) the size and type of boat to be used;

(b) the particular activity or activities that must be provided for, as against those that are desirable only.

A particular site may be suitable, or could be made suitable at acceptable cost, for certain sizes and types of craft. It may provide, or be capable of development to provide, for some but not all of the several activities listed above.

It should also be mentioned at this point that the civil engineer, the naval architect, the master-fisherman, the fishery industry specialist, the economist and the sociologist, all have their part to play in the determination of the provisions necessary for most of the projects.

A LANDING PLACE ON A DIFFICULT ROCKY COAST AT DUNQUIN IN S.W. IRELAND

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Photo No. 2/A Approaches to the landing place

A LANDING PLACE ON A DIFFICULT ROCKY COAST AT DUNQUIN IN S.W. IRELAND

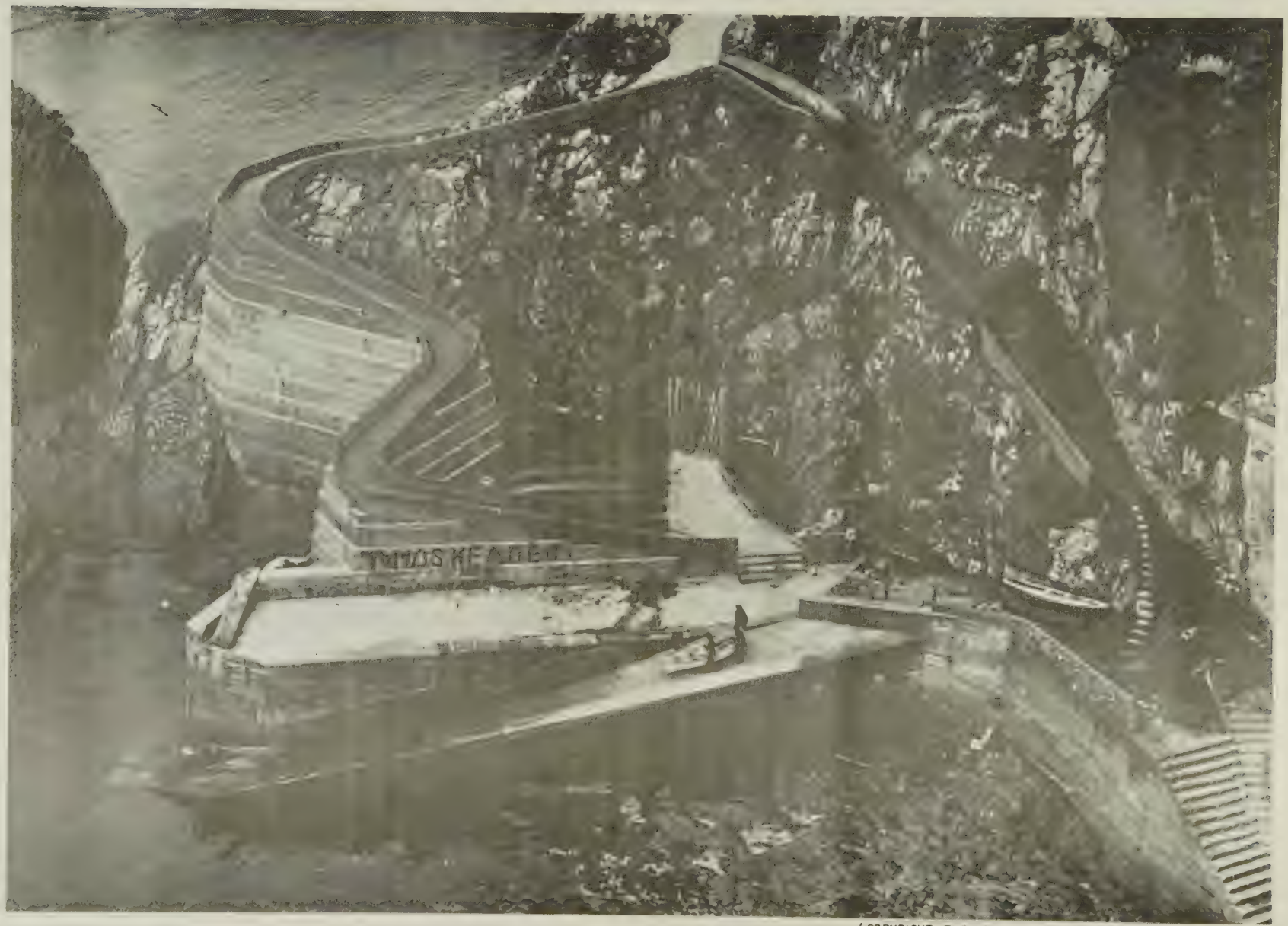

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Photo No.2/B A close up showing the protected boat yard

CARRICK-A-REDE, N. IRELAND

(PHOTO: THE IRISH SKIPPER, BALLBRIDGE DUBLIN)

Photo No.3/A Carrick-a-Rede: A very difficult island fishery landing place approached from the mainland by a rope bridge and the boats lifted ashore by means of a timber derrick

(PHOTO: THE IRISH SKIPPER, BALLBRIDGE DUBLIN)

Photo No.3/B Carrick-a-Rede: Detail of the derrick mounted on top of the cliff face

3. GROUPING OF FUNCTIONS

Most projects will present a combination of two provisions which must receive consideration. The first is the Boat, defined as the type of vessel needed to operate as a catcher unit and to bring the catch back to the shore under the prevailing conditions. The second is the Landing, defined as the facilities needed to bring the vessel to safety and its catch ashore, it may range from open-shore facilities with no protection of any kind against waves, current drift and sedimentation to water areas protected against these factors.

3.1 Boat

The boat design suitable for the particular conditions will depend upon the type of fishing and upon the physical characteristics and forces to which the boat will be subject both while fishing and at the landing place. As for the "estuary-type boat", it will primarily be the prevailing conditions on the fishing ground and the type of fishing which determine the design. On the other hand, the situation on the open-sea coast may call for special craft which can also operate under and withstand heavier forces during the landing operations. This boat study should mainly concentrate on "difficult landing conditions", which usually means that the boat may have to pass through a zone of steep or perhaps finally breaking waves.

In principal, boats may include the following designs:

(i) light beach boat;

(ii) heavy boat: (a) mono-hull, (b) multi-hull } for landing directly on beaches;

(iii) heavy boats for use where inlet and entrance facilities are provided and maintained mainly for other purposes, e.g., commercial harbours, drainage canals, cooling water channel, etc.

(iv) heavy boats for use in connection with deep offshore installations, including open jetties and artificial islands.

Finally, the boat provision may also include motherships and carrier vessels, anchored or cruising, and barges.

3.2 Landing

A few general pointers to situations or locations which might offer the best grounds for the provision of an economic facility are listed in Figure 1. Naturally the actual conditions at any particular site under consideration must be carefully assessed before any solution is recommended.

Location	Pointers to best grounds for solution
Estuary:	Select a channel considering stability of location and cross-sectional area. Install training walls for flow and sedimentation. Install sediment traps for periodic dredging. Install various facilities, including walls, ramps, and winches, etc.
Open coast: (i) Rocky with no littoral drift; (ii) (a) littoral drift shore, if uninterrupted, or (b) interrupted with headlands.	Choose a sheltered area behind any conveniently-placed island, headland, rock reefs or shoals. Steep cliffs or banks may demand platforms, ramps or a sloping pier, blasted slip, quay wall, jetty. Use an uninterrupted shore section with steep shore, if necessary made steep by jetty or groin. Winch system on open beach may be a solution. Open trestle jetty, possibly with impermeable head may be practical. On headland shores choose downdrift side of headland in area with little accumulation or slight erosion.
Tidal inlet on open sandy shores:	Choose stable entrance, or improve entrance with one or more protecting jetties or other sand trapping installations, and possibly bypassing arrangements to keep a stable entrance fit for navigation.

Fig. 1

Principles of solutions to the problems of providing landing facilities under difficult conditions

4. IDENTIFICATION OF SOME OF THE MORE COMMON PROBLEMS ASSOCIATED WITH DIFFICULT COASTS

Many factors contribute to the production of hazards in the establishment of ports or landing places in difficult conditions. Figure 2 outlines some combinations of the physical characteristics which are found in many of the problem areas and shows how these areas may be classified in two main groups:

(i) Estuarine locations - where tides, sedimentation and currents normally present the chief difficulties, and where foundation problems may lead to high costs.

(ii) Open coast conditions - where waves, tides, currents and littoral drift conditions, singly or combined, present the difficulties.

It will be noted that bottom topographical, soils and transportation aspects generally associated with the geographical location, are common factors in all cases under consideration, but these factors are not necessarily the most important in each case.

Practical solutions to the identified problems do not always depend only upon the combination of each of the individual physical problems of the group, but frequently upon the actual magnitude of each one of these problems. In order to evaluate the possibility of practical solutions, physical data must be gathered, making it possible to classify each particular proposal and apply certain main principles to achieve possible solutions. The necessary physical data can be obtained mainly by surveys of a hydrographic and geotechnical nature, clearly defined in each particular case, but frequently other information of a more widespread nature is also required.

Location			List of Problems								
Item No.	Group	Classification	Bottom topography	Wave action	Tidal range	Currents	Littoral drift	Sediment transport (river estuary)	Soil	Accessibility (by land and sea)	Location geographically (Distance from population centres)
1.	Estuarine locations										
	(a)	deltaic	X		X	X		X	X	X	X
	(b)	open, upstream location	X		X	X	(X)	X	X	X	X
	(c)	open, entrance location	X	X	X	X	X	X	X	X	X
2.	Open locations										
	(a)	no littoral drift	X	X	X	(X)			X	X	X
	(b)	littoral drift uninterrupted location	X	X	X	(X)	X		X	X	X
	(c)	littoral drift on coastline interrupted by tidal inlets, lagoons, bays,	X	X	X	X	X		X	X	X

Fig. 2

Some indications of problems to be dealt with in various locations

X indicates that the particular problem is encountered in most cases

(X) indicates that the problem is not always present

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Photo No. 4/A Approaches to the landing place

A LANDING PLACE ON A DIFFICULT COAST AT MALINBEG IN N.W. IRELAND

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Photo No. 4/B Close up of the facilities

Photo No.5 Medieval painting of a sloping pier; Italy early 1600's. A forerunner of many similar structures developed in later centuries to meet the needs of small ports with high tidal ranges

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Photo No. 6 The Curragh, a light-weight skin covered wood-framed boat developed over the centuries in Ireland to suit the rugged conditions of the West Coast

(PHOTOS: L.D. JOHNSTON)

Photos No. 7/A and 7/B Through-the-surf launching in Peru

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Photo No. 8 Special craft developed in Denmark for through-the-surf launching and landings

Photo No. 9/A

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Photo No. 9/B

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Photos No. 9/A and 9/B A boat developed in Denmark for through-the-surf launching and landing with the assistance of winches

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Photo No. 10 A long sandy beach of the type frequently found in Denmark and other parts of Northern Europe

5. MEANS OF IMPROVEMENT

There are a number of situations where it is possible that marked improvement in the operational conditions of the small-scale fishery could be affected. Most would need some degree of study or investigation in the general sense before an adequate solution might be obtained, but a small number of selected situations could probably be bettered with a suitable application of known techniques.

Some future studies and fields of activity might include:

(i) the design of a vessel type capable of landing safely and conveniently on beaches through ocean swells and surf, while still retaining the ability to conduct an economic fishing operation;

(ii) the development of a low-cost breakwater or wave screen to reduce surf effects to an acceptable figure; such a breakwater might be a floating surface absorbent type or a modified form of any of the more conventional types.

(iii) the design of suitable beach-landing gear that could bring ashore or launch vessels through at least moderate swells with minimum danger to the equipment, operators and the catch;

(iv) the design of structures, including open piers, on open beaches which would permit safe landings or beachings without fear of littoral drift seriously damaging or limiting the use of the facility;

(v) the study of estuarine fishery port developments in areas of heavy siltation leading to the design of facilities with low operational and maintenance costs;

(vi) the provision of a means of handling vessels on cliff-surrounded coasts, e.g., by moderate-cost elevated harbour basins, vessel elevators, etc.;

(vii) the effective development of combined harbours (commercial and fishery) without fear of subsequent absorption of the fishery unit by the "big brother" commercial unit, as has so often happened with an inadequately planned fishery project.

A number of Member Governments, especially through their bilateral aid agencies, have shown an interest in the solution of these problems, but funds to permit a satisfactory approach are not readily available to match this interest. A number of Governments are particularly fitted to deal with certain specific problems. Denmark, with a number of port and minor landing place developments on its long stretches of sandy coast, has much to offer. Norway, with extensive experience in steep-sided fjords and isolated island fishery bases and a technical university in Trondheim experienced in the solution of a number of the problems resulting from such situations, could proffer much in these fields. The Netherlands, with its first-rate hydraulic research facilities producing practical solutions for many of the world's coastal problems, could play a very prominent part in any improvement, while other countries such as Great Britain, Ireland, Iceland, Spain and France, with their rugged coasts and old-established ports and landing places on or near ocean-swept coasts, could contribute their considerable experience and perhaps financial backing.

6. POSSIBLE LINES OF INVESTIGATION

Any realistic investigation, either specific or general, must be based on a detailed survey and assessment of any existing and likely situation, including:

(i) fishing grounds location;

(ii) type of resource, gear in use and method of fishing operation;

(iii) existing type and size of vessel being used;

(iv) limitations on type and size of vessel caused by external conditions, e.g., technological capabilities of the fishermen, probable size of catch, sea conditions on the grounds, and possibility of improvement in gear and methods;

(v) vessel types required to provide improved conditions for the crews and industry;

(vi) trip duration and frequency, quantity and quality of catch, ice, fuel and water needs quantified, unloading methods, crew amenities and services relating to rest, recreation and supplies;

(vii) maintenance and repair facilities for the boats, gear and equipment;

(viii) marketing transportation and distribution systems presently in use and to be adopted.

To produce a fair result from the engineering review and investigatory planning which would meet all or most of the operational conditions, a number of simultaneous non-engineering investigations (i.e., economic urban social planning, etc.), should also be conducted. These are not specifically referred to in this report, but nevertheless must never be ignored in the overall planning exercise.

Considering, therefore, only the engineering aspects, a number of particular subjects for detailed examination and investigation, pertaining to the types of problem presented, are identifiable.

6.1 Vessel Aspects

Having determined the beach or near shore sea conditions to be encountered, a determination should be made of necessary strengthening of framework and shells; consideration of power unit and how it is mounted; stability factors built into vessel design to prevent capsizing or pitch poling; keel modifications to enable it to be hauled over irregular beach profiles, etc., are details to be applied after deciding on the general gross tonnage rating, the desirable layout of vessel, and whether it should be a mono-hull or multi-hull platform.

Various investigations, in actual conditions, could also be made into the forces required to haul craft or skids and rollers of various types; the design of suitable out-haul anchorages for moving craft down-beach; the actual launching operation of the boat into the surf, and an analysis of various approach and recovery techniques.

6.2 Uninterrupted Open Shores with Littoral Drift

It is in this sector, where unfortunately a large proportion of small-scale fisheries of the tropical world exist, that the most difficult problems originate. Examples might be quoted to put the problem in dimension. In West Africa, areas of rich fishery resource exist off the Mauretania Coast, where no break in the sandy coastline exists over a stretch of more than 300 miles. Two further stretches of sandy coast of considerable length occur north and south of the city of Dakar in Senegal. In both India and Western Malaysia the whole of their eastern coastlines are problem areas of this type, broken only by a few deltaic sand traps worsened by the monsoons, where every site chosen for marine development for whatever reason presents grave technical problems to the developer. It may seem at the outset that nothing much can be done to assist the indigenous fisherman with the sort of budgetary allocations that may be available for the project. Since the problem is so universal, however, every opportunity should be taken to experiment with a form of demonstration or pilot project, controlled over a few years, utilizing a number of different solutions, each applicable to the site chosen.

The main difficulties in the provision of satisfactory facilities under these conditions stem from two main elements; the waves which can affect vessel movement and can be a hazard; and littoral drift, which can threaten even the most costly structure and make any facility useless in a very short period of time by sand accumulation. The sandy drift in many regions can exceed 2 000 000 tons of movement past any point per year (e.g., drift varying between 500 000 t and 2 000 000 t/year along the length of the East Coast of India; about 2 000 000 t/year on the Togo/Dahomey/Nigeria coastline, and at St. Louis in Senegal where a wide sand spit has grown by over 10 kilometers from this cause in about 25 years).

Any solid construction set up in the path of such sand movement will collect material and cause errosion damage on the downstream side, unless costly beach nourishment is conducted to stabilize conditions. Normally such treatment is beyond the limits of a small fishery unit, since it may involve handling by pumping or dredging, say 1 000 000 t of material per year at even a low cost estimate of $ 0.4 per ton.

Solid structures are therefore not usually possible unless they can be placed on alignments such as the T head of a jetty where they do not disturb the material transportation to such an extent that shoalings of large magnitude will result. Accordingly, therefore, most structures may have to be provided with open-work design with little wave protection to be expected.

Costly projects, such as protected island basins in deeper water outside the sand drift zones, or elevated basins served by hydraulic or mechanical lifts could sometimes offer a solution, but would certainly not be feasible for small-scale fisheries.

6.3 Open Shores with Rock (No Substantial Littoral Drift)

While prototype conditions may indicate that drift is not of importance and a substantial degree of stability is apparent, there may still be no guarantee that conditions will not deteriorate if major changes are applied to the natural regime. Care should be taken in the application of normal precautions in structural design, location and alignment to minimize such changes.

In cases where the open T-head structure may be the most suitable the deck may have to be portable, for removal during the worst periods of wave activity.

If rock occurs, some amelioration may be obtained by rock blasting of a limited nature to provide channels and small basins protected by other offshore rock ridges. An example here might be the cutting of a new channel through a coral or similar type reef to reach calm water or lagoon conditions inside.

Sometimes on rocky coasts, where calm weather may exist over lengthy periods, aids to the fishermen with smaller craft can be provided with platforms and hard stands prepared above higher water levels, accessible by means of ramps with winches, cranes, lifts (electric, hydraulic or mechanical), depending on the local circumstances.

6.4 Estuaries and Coasts with Inlets

Surveys and Investigations. In all cases the civil engineer must base his findings and recommendations on an accurate and complete knowledge of site conditions. Carefully supervised investigations must be conducted on the hydraulics and sediment transportation situations, in addition to the more usual topographic and hydrographic surveys.

Dredging Considerations (Initial and Maintenance). Normally the necessity of initial and recurrent maintenance dredging including bypassing arrangements must be carefully examined, and the possibilities of obtaining the necessary dredging equipment at intervals for reasonable cost must be thoroughly investigated. The maintenance dredging operations, if required, should be as accurately quantified as modern techniques make possible, to enable long-term dredging programmes to be included in the project evaluation. Costs of these operations could be the cause of the rejection of an otherwise suitable project, or of permitting its implementation; such important decisions should only be made on the basis of very reliable estimates. Some freedom in the choice of dredging systems, sea or land-based, may be possible in the case of estuarine facilities which could not be considered feasible in open coast conditions. This subject, the choice of the dredging system to be adopted, could possibly form a special line of enquiry on its own.

7. NATIONAL EXPERIENCES IN DIFFICULT COASTS TECHNOLOGY

Appendix 1 gives some brief details of the experiences which certain developed or developing countries have had in the past in solving these problems. It will be seen that a number of these are among the richer developed countries, with extensive ocean and coastal fisheries. Briefly, their situation and experience can be summarized below:

7.1 Denmark

Low-lying sandy beaches with a few river estuaries are the general coastal conditions found in this country. Rock is rarely encountered. Provisions include open beach landings with winches, open beach harbours, open tidal inlets, all to serve fishery industries. Much experience has been gained by practical application of a number of differing remedial works on sandy coastlines.

7.2 Norway

The fjord coastline of Norway has produced little development in the integrated fishery harbour sphere. The deep protected fjords have provided safe havens even for small craft and generally each vessel has been based on the operator's "back-yard" landing place, or lands directly at one of the many industrial plants built on the steeply-sloped rocky coasts where sandy beaches rarely occur. Many of the outer islands have, however, in recent years demanded improvement of their hazardous conditions and a number of interesting improvements have been instituted in the small fishery centres where wave action is always present. These have included a number of special breakwater and jetty constructions.

7.3 United Kingdom and Ireland

Many conditions similar to both Denmark and Norway are found in both the UK and Ireland, but the principal value of these countries' experiences is that since the early 1800's they have met and tried to solve a very wide range of coastal problems related to small harbours and landing places with very limited resources. Results of trials, successes and failures can still often be seen and studied, and much historical documentation is readily available.

7.4 Netherlands

This country with its continuing fight against the sea has built up a tremendous knowledge of the sea's activities, especially in its hydraulic laboratories. The results of its continual campaigns have been applied in many cases with success to the solution of its own problems, and increasingly since the Second World War it has made this technology and experience available to the world at large.

7.5 Iceland

This country has probably the greatest variety of conditions within a small area, ranging from the primitive to the advanced. In addition there are many kinds of industrial and educational facilities pertaining to the fishery industry and fishery engineering.

7.6 Ex-Colonial Countries of Asia and W. Africa

Due principally to the efforts of British, French and Dutch engineers between the 1700's and the early 1900's, a number of harbour developments of major proportion were attempted in difficult zones with mixed success. The major port of Madras, with its excessive sand drift and frequent typhoons, can operate all year round with continuing maintenance dredging, and with changes over the years of the harbour layout to meet local conditions. The port of Lome in Togo until recently was served by a large openwork T jetty operating under similar conditions to that of Madras. These are merely two of many major developments which could be usefully examined as guides to the application of experience to much smaller units.

8. RECOMMENDATIONS FOR EARLY FAO IMPLEMENTATION

The Food and Agriculture Organization has a limited civil engineering permanent staffing, but otherwise is ideally situated to act as a coordinator for the initiation and control of examination, experiment, provision of demonstration works and pilot projects in the small-scale fishery sector. Such widely-based exercises and projects will require much assistance from external sources - technologically from the Member Nations' laboratories, institutes and consulting firms, industrially from their Fishery Departments and small boat fishery units; financially from these Governments' Bilateral Aid agencies - in addition to the FAO's own funding arrangements, be it Regular Programme, UN Development Programme, or one of the multilateral sources such as the World Bank or the Regional Development Banks.

A small beginning over a period of 1 or 2 years is advisable to establish an organization and base for later expansion. For such a preliminary effort, only the more simple and least costly operations should be attempted. Appendix 5. gives an illustration of how this early implementation might be conducted. Use of an existing project site organization in a similar sector should, if possible, be made, in order to reduce the overheads and servicing charges.

In outline the following pattern of work might be adopted:

Phase I. Preliminary Discussions with selected and interested agency or agencies, to identify:

(i) the region and countries in which the project should be located, bearing in mind the various political, social, industrial and technical factors involved;

(ii) the general location of the project;

(iii) the detailed approach to be made to implement the project;

(iv) the responsibilities to be assumed by the various participating agencies and laboratories;

(v) the preparation of preliminary order-of-cost estimates;

(vi) the methods of funding recommended for the various phases of the project implementation.

Phase II. Investigation, Survey and Preparation Activities

These activities would be determined and defined in Phase I, but a fair assumption is that they might include the following:

(i) Site surveys, topographic, hydrographic and hydraulic in their broadest sense, and including fishery operational and activity surveys;

(ii) general site selection and determination of further activities required for detailed preparation;

(iii) Conducting of further detailed preparations, geotechnical investigations, small-scale or mathematical model studies, simultaneously with other associated non-engineering studies, leading to project evaluation and feasibility and project definition;

(iv) approval or acceptance of project layout:

(v) detailed design elements.

Phase III. Final Implementation Phase

The outcome of Phase II should lead directly to the construction and development of the project, and would include all other activities such as technical assistance in organization and management, and training at all levels of the operation, with particular attention being paid to new activities and methods.

Phase IV. Post-Implementation Appraisal and Review

This most important element would essentially be conducted at intervals to record practical operation results, and may continue annually for a number of years to enable modifications to be built into future projects of a similar type.

9. COST ESTIMATES FOR A PRELIMINARY PROJECT

A project of a broad spectrum type might be costed as follows, based on 1974 prices, though some specific elements, if conducted in isolation, might be implemented at much less cost.

Phase I. Preliminary Discussions	US $
3 Experts, 3 to 4 days @ Rome or Government capital	2 500
P4/P5 Staff - 1 m/m plus travel and per diem	3 350
Phase II. Preparation Activities	
(i) Site surveys	30 000
(ii) General selection activity	3 000
(iii) Detailed preparation	100 000
(iv) Approved discussions	3 000
(v) Detailed design	15 000
(vi) HQ supervision and participation 4 m/m including travel expenses	18 000
(vii) Organization Service Charges, say 15 % and miscellaneous items. Average (say)	25 000
Sub-total I and II (say)	200 000

N.B. Item (iii) does not cover any large-scale hydraulic model investigations. An additional $10 000 to $100 000 would be required for this, the actual amount depending on the complexities of the investigations and of the site.

Phase III. Final Implementation

It would be difficult to cost this phase for an unknown facility and to allocate these costs between the agency and counterpart components, and should not now be attempted.

Phase IV. Post-Implementation Appraisals

Annual visits of 2-week duration for a minimum of three years should be included in project costs:

	US $
say ½ m/m per annum each for two experts, i.e. for 3 years	
a total of 3 m/m including HQ and Consultancy and travel expenses @ say $ 4 000 per month	12 000

Additional figure of approximately 10 % should be added to each phase total costs to cover contingencies making a rounded off order of cost summary as follows:

	US $
Phase I	6 500
Phase II	220 000
Phase III (not estimated)	-
Phase IV	13 000

10. LONGER TERM IMPLEMENTATION

Further stages of any extensive programme of work could only be measured against early successes or failures, but an attempt should be made to "farm out" to different agencies specific areas of experimentation and investigation - the results of each project to be built into further practical developments. It is in the allocation and general supervision of such activities that the coordination functions of the FAO engineer group will be principally exercised. The methods adopted should for ease and convenience follow closely the existing patterns of project formulation, presentation and supervision.

It could be, for instance, that one national agency should be specifically geared to investigate the vessel design situation, another might be asked to investigate the possibilities of producing low-cost floating or other type of breakwaters, while a further study might be made on the resistance to littoral drift hazards of varying types of structure.

Such programmes can be studied in more detail when it is known that the general principles of the project are accepted by a sufficient number of agencies to make realistic planning worthwhile.

Appendix 5 indicates also how a project for the eastern coast of India might be submitted in its preliminary draft stage.

11. SOME EARLY ACTIVITIES LEADING FROM THE EXPERT GROUP MEETING

Due to a number of factors, principally the short staffing of the civil engineer section, and the serious reductions in FAO and other UN Agencies' budgets, little serious progress other than the data collection and particular project study has occurred in the development of this worthwhile project during the few years up to 1974. A number of attempts were made to obtain funds to promote projects. Despite some initial interest by both the Danish and Norwegian Government Agencies, no funds for such a practical approach were made available, neither could UNDP project approval be obtained. Appendix 2. includes the general summaries of such approaches.

Due to urgent submissions made by one of the experts attending the meeting, Mr. E.W.H. Gifford, the Overseas Development Agency of the UK financed a series of tests on a beach landing multi-hull craft developed privately by Mr. Gifford. The initial results of these most interesting experiments conducted in England and on site in Nigeria are published in reports (Ref. 23/25 in bibliography) extracts from which are given in Appendixes 3.2 and 4.1). This form of intervention, when properly coordinated with other schemes, might well be followed in future implementations.

During the original FAO/UNDP Fishery Harbours Project in India, which will be continued for a further short period, financed by the Swedish International Development Authority, a number of proposals prepared in detail have been included in the programme of development which would be of interest in the solution of difficult coast problems. These included the preparation of open coast jetties on the southern coastline of Tamil Nadu. It is known also that this same Authority is interested in providing similar facilities in other sections of the Bay of Bengal coastline.

The UNDP Regional Office for Asia and the Far East had also indicated their special interest in the development of projects aimed at improving fishery landing operations on difficult coasts in their region.

The discussions at this first meeting had indicated that some form of guidance, possibly in the form of a permanent committee of three or four experts meeting at least annually, would be worthwhile. Details of membership could be decided when the Governments and other agencies have declared their interest; and membership should as far as possible echo the range of professional activity and experience in the regions under consideration.

APPENDIX I

NATIONAL EXPERIENCES IN THE PROVISION OF FACILITIES IN DIFFICULT COASTAL CONDITIONS

A. DENMARK

1. Denmark has no estuarine type situations, although the entrance to the southernmost port on the west coast of Jutland facing the North Sea does present some of the features associated with an estuary. The Danish North Sea coast (Fig. 3) on which the fishery bases are located is a sandy shore exposed to heavy wave action. It has a number of open-shore beach landings, partly provided with motorized winch arrangements (e.g. Klitmoller and Steinbjerg), one open tidal inlet with a fishing port (Lim fjord with the Thyborøn entrance) being maintained at high cost and two inlets at Thorsminde, (Nissum fjord) and at Huide Sande (White Sand, Rnigkøbing fjord), built as drainage canals but provided with navigation sluices as well as with drainage. Furthermore, there are two open-coast harbours, one at Hanstholm recently completed, and another at Hirtshals completed in the thirties but expanded later. These harbours were built at high cost. Actual experience of maintainance at Hirtshals shows that dredging of a few hundred thousand cubic metres a year is necessary, while that of Hanstholm is not yet fully known. Finally, the Port of Esbjerg, located at the southern extremity of the uninterrupted shore, is a combined industrial and fishing port protected by islands and connected with the North Sea by a dredged channel requiring maintenance dredging of some few hundred thousand cubic metres annually.

2. Since the main problem met with in developing countries is the provision of inexpensive facilities for relatively small boats, it is mainly the Danish open-shore facilities, and perhaps the less expensive drainage entrances, which are of special interest. These entrances may be open or closed, like those at Thorsminde and White Sands. The large-scale open tidal inlets like Thyborøn and the open-coast harbours would be of interest only where the development of major fishing ports are envisaged, e.g. Madras, Karachi, etc.

Implementation of a Study Programme Utilizing Danish Experiences

The first task would be to collect all available information on construction, maintenance and operation on all modest-sized (tidal) entrance installations on sandy shores. Designs in a few characteristic cases should then be group-classified in accordance with exposure and degree of development and improvement desired, and those situations should be identified in the field where these principles and designs could be used.

An opportunity should be given in this study to comment on the existing designs and approaches, and to offer suggestions for new ones. A recommended implementation leading from the study would seem to include the following steps:

(a) an evaluation by FAO of a number of particular cases on open shores where improvements for the fishery would have actual and practical interest;

(b) identification of those locations where the Danish experience on open-shore installations could be used to advantage;

(c) selection of one particular location for actual examination;

(d) review of problems of this particular location;

(e) selection of a site or sites for more detailed technical and economic investigation;

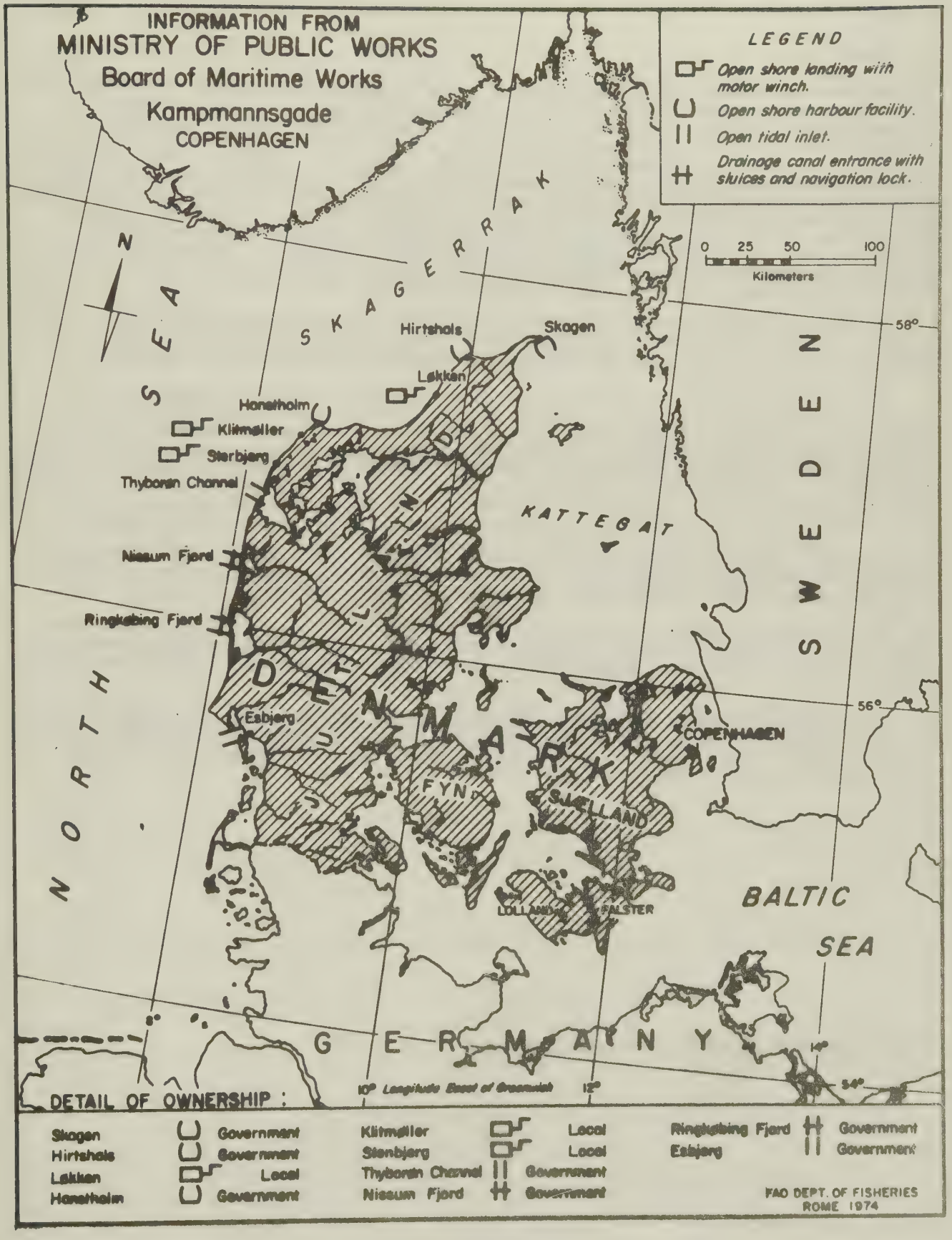
(f) preparation of a recommended scheme in the light of the Danish experience;

(g) construction and monitoring thereafter of the recommended scheme.

It is emphasized that the recommended solution should not be looked on in isolation, the proposed project should be fully prepared in an integrated manner in the form of a small-scale fishery base development including vessel improvement, efficient handling and distribution of landings and the provision of adequate services for the small vessels, their landings and crews.

Such a project could be strongly recommended to the Danish Government International Aid Agency (DANIDA) for their serious consideration.

FIG. 3


INFORMATION FROM
MINISTRY OF PUBLIC WORKS
Board of Maritime Works
Kampmannsgade
COPENHAGEN
LEGEND
Open shore landing with motor winch.
Open shore harbour facility.
Open tidal inlet.
Drainage canal entrance with sluices and navigation lock.
N
0 25 50 100
Kilometers
SEA
SKAGERRAK
Hirtshals
Skagen
Løkken
Hanstholm
Klitmøller
Sterbjerg
Thyborøn Channel
Nissum Fjord
Ringkøbing Fjord
JUTLAND
DENMARK
KATTEGAT
SWEDEN
NORTH
Esbjerg
FYN
SJÆLLAND
COPENHAGEN
LOLLAND
FALSTER
BALTIC
SEA
GERMANY
58°
56°
54°
10° Longitude East of Greenwich
12°
14°
DETAIL OF OWNERSHIP :
Skagen Government
Hirtshals Government
Løkken Local
Hanstholm Government
Klitmøller Local
Sterbjerg Local
Thyborøn Channel Government
Nissum Fjord Government
Ringkøbing Fjord Government
Esbjerg Government
FAO DEPT. OF FISHERIES
ROME 1974

B. NORWAY

1. There is quite a different situation in this country as compared with Denmark. The fishing ports in Norway are mostly located in protected fjords eliminating the need for expensive breakwaters, although some are located in outer bays on the offshore islands or coasts which are rather exposed to the severe conditions of the Atlantic and Arctic Seas. A large number of these ports were built with support from the National Government, which appropriated funds for the construction of solid jetties for clearance of rock in the mooring area, and in some cases also for dredging of channels. The costs of establishing wharves, piers and other facilities were generally borne by the local interests, and these facilities therefore are often of light and relatively inexpensive design. The principal Norwegian experience on fishing ports is therefore in design of lightweight wharves, slipways and similar facilities, and in the provision of rubble mound breakwaters. In addition, of course there is a considerable experience in building all kinds of fishing vessels from small 5-t "sharks" to 2,000 t "fabrik-vessels", together with all kinds of auxiliary equipment that the fishing industry may require.

An additional element, however, is that the long-standing Indo-Norwegian project based at Cochin in India has developed a Norwegian experience which is quite different from that of the domestic Norwegian situation, and the scope of Norwegian experience has therefore been somewhat broadened.

2. Reference is made in Fig. 4 to the works which are in progress or recently completed. The Norwegian Government has been expanding fishing ports by jetty improvements at several places in the northern part of Norway, e.g., at Belevag, Sørvaer, Vaerøy and Svartnesbukta. Dredging by rock blasting, suction dredging and dipper dredging is under way at a number of other ports, while in ports like Båtsfjord, wharves are being built with government support. These wharves are usually of the open pile design - reinforced concrete trestle type cast under water by a tremy method, which has the advantage that no heavy equipment is needed for construction. Two other lightweight designs of low cost have been popular in Norway, one using creosoted timber, the other old rails welded or bolted together.

3. Norwegian engineers educated at the Technical University of Norway are well aware of these types of jetty and wharf designs as well as newer types using steel hollow piles. Experience with the use of high quality reinforced concrete for overwater as well as underwater design is extensive.

4. The Norwegian experience in foreign commercial fishery port work is low. The only place where major harbour work has been done by a Norwegian engineering company is in Ethiopia (Rubble Mound jetties), apart from the Indian Government small fishery ports works associated with the Indo-Norwegian project.

5. The Norwegian Government International Aid Agency (NORAD) could undoubtedly be of much assistance to FAO in planning of fishery ports on rocky shores, in boatbuilding, provisions, canning and other processing plants. Also Norwegian fishing equipment is of high quality including winching systems which could also be utilized in certain different conditions for land usage.

Fig. 4

Examples of works presently under execution or recently completed in Norwegian Fishing Ports

a. Svartnesbukta on the Arctic Ocean at Vadsø, close to the Russian border. Major fishing port under construction (NATO funds). Supposed to "unload" the Port of Vadsø. Rubble mound jetties. So far no wharf.

b. Båtsfjord, west of Vadsø. 600-700 ft open RFC wharf planned for installation on rock bottom.

c. Berlevåg - major fishing port being completed. Exposed location. Rubble mound jetties and 15-25 t tetrapodes.

d. Honningsvåg at the North Cape floating breakwater under discussion. Research and preliminary project by the Institute for Harbour Research (M.Sc. thesis).

e. Sørvaer - construction of rubble mound jetty up to 50 ft depth in progress. Model tested.

f. Skjervøy - rock blasting and dredging to provide more space and depth in the harbour.

g. Vaerøy (Lofoten) - rubble mound jetty designed and model tested. Dredging by dipper dredge often preceded by rock blasting and some minor hydraulic pipeline dredging is in progress, or was just completed, at various places like Byggenes, Arviksand, Andenes (NATO air base) etc.

C. BRITISH ISLES

In the British Isles - the United Kingdom and Ireland - there are a number of special features which would be of interest to the Engineer in studying the relationship between coastal conditions and the small craft fishery industry.

(i) Craft Designs

In the UK there is still a very active fishery based on open beaches. It is probable that the only European country with a greater number of beach-based craft is Portugal. The highly developed Coble is still in use by the hundred on the Yorkshire coasts, where they have now developed it to a length of about 10 m with 50 h.p. inboard diesel engines capable of hauling a small trawl. The launching arrangement is by means of wheeled trolleys over flat sandy beaches. While they generally do not operate in heavy surf, nevertheless the techniques are worthy of study and could be applied in certain regions.

Another type of beach boat works from Sussex, where about 60 are presently based on rather steep shingle beaches, using skids and windlasses for launching and landing. The equipment used is much less costly than that currently in use in Denmark, and might be appropriate, with modifications, for use in certain West African conditions where frequently the sandy beaches would be relatively steep and the surf not too intense.

It might also be noted that, while the Danish system is apparently dying out, both the Yorkshire Coble and the Sussex beach boat are very active.

In Ireland, where coast conditions are generally somewhat different from the UK, with a surfeit of rock, the early traditional craft were the skin with timber frame curraghs. Light of weight and easily carried, these vessels were also, in skilled hands, very seaworthy in heavy seas. The advantages with this type of craft in a poor country included a very simplified low cost landing facility, on the rocky slopes or on the beach. It is not certain, however, if this system, or a modification, could be applied to other regions without extensive training and experience.

(ii) Fishery Base Facilities

Over the years, but particularly during the last century-and-a-half, many attempts have been made, mostly by private landowners or local townships and railway companies, to provide fishery bases to meet the needs of specific landings and simple processing operations. Some of these formed the basis of the modern developed industry, while others decayed for a number of reasons, some of which can be identified as difficult coastal conditions, e.g., erosion, siltation, wave action, etc. A study of a representative sample might produce results which could be applied elsewhere.

One typical structure which has developed throughout the British Isles, especially on rocky coasts but also in sandy coves and inlets, is the sloping pier or slipway used for landings as well as hauling the craft ashore. Surprisingly little use seems to have been made elsewhere in situations favourable to such a simple structure.

D. UNITED STATES

Undoubtedly the United States, and in particular its east coast, provides the most suitable site to study the effects of estuarine conditions and coastal drift of varying kinds on simple landing structures.

In these conditions, much useful work could be done as extensions of the many and extensive programmes of work and research continuously being implemented.

APPENDIX 2.1.1

PROJECT IDEA FOR FAO/DENMARK COOPERATIVE PROGRAMME: SUBMITTED 1969

1. TITLE: Studies on the Problems Associated with the Construction of Small Fishery Harbours and Landing Places on Difficult Coasts of Developing Countries

2. BACKGROUND:

During the recent FAO Internaticnal Conference on Fishing Ports and Port Markets (Bremen, 1968) it became very apparent that many, if not all, of the developing nations had met serious hindrance in the development of their fishery industries, be they large or small, due to the difficulty or impossibility, with present techniques, in constructing ports or landing facilities. Extensive sections of their coastlines were subject to either excessive and sometimes continuous swell, or to the presence of littoral drift of a high order of magnitude, or to other geological or morphological reason. One result in at least two of the less backward countries has been the combination of commercial and fishery ports which, within a short period, has led to major difficulty in the operation and further development of the fishery unit.

Accordingly, the Conference unanimously requested:

"1. that FAO form small working groups to study the following subjects:

(a) the planning of fishing ports for small vessels;

(b) the construction of small ports on coasts subject to strong littoral drift;

(c) the planning of fishing ports adjacent to commercial ports, and

2. that FAO should inaugurate research studies on these subjects in association with these working groups, the resulting papers to form the basis for the next Conference."

FAO budget for the next biennium has excluded the implementation of these requests through lack of funds in the Regular Programme Budget. Denmark is one of the principal developed nations which has developed their fishery on difficult coastlines similar in many respects to those of a number of the developing countries. It has offered a number of partially successful solutions and would be a most suitable choice for the location and organization of technical discussions making use of the many experiences gained by their engineers and scientists. Denmark is also particularly well-suited because of its well-known hydraulic laboratories and internationally-known experts in these fields of study.

3. PURPOSE

The solution to many of the problems presented to the engineer in preparing projects for landing places on such difficult coastlines is most urgent. Many of the developing nations, e.g. India, Ghana, Ecuador, Togo, etc., have these problems which are stultifying a proper development of their fishery industries. Even a moderate degree of success leading from such a working group would be of great assistance to the many countries now seeking assistance in solving their problems.

4. DESCRIPTION AND WORK PLAN

Discussions by a group of international experts in the various specialities should take place in Rome or Copenhagen, as follows:

4.1 Short preliminary meeting to identify the problems and prepare terms of reference and timetable for further activities.

4.2 Main discussion group activity with associated experimental work in Danish engineer laboratories and at sites. This might consist of three sessions of approximately 1-2 weeks each, at say 3 to 4-monthly intervals, while experimental model and prototype experiments and investigations were taking place.

4.3 Finalizing and reporting on Group activities including publication of technical volume based on the work of the Group.

5. ESTIMATED COSTS

5.1 Personnel

The group should basically consist of four persons with a number of standby or part-time specialists on specific subjects associated with the problems concerned. They might consist of:

(i) Fishery Harbour Engineer, FAO;

(ii) Marine structures design engineer with international experience;

(iii) International specialist on coastal drift;

(iv) Fishery or small harbour planning specialist;

and other experts to be called on as required:

(v) Naval architect with considerable experience of small to medium-sized (e.g. 6 m to 25 m) fishing vessels;

(vi) Master fisherman/Gear technologist;

(vii) Fishery economist;

(viii) Mechanical engineer with considerable experience in fishery vessel building and operation.

(ix) Experts on fishing vessel tank testing;

(x) Management expert with experience in the social aspects of harbour development in developing countries.

5.2 Fellowships

It would be recommended that two Civil Engineer fellowships be awarded to assist in the practical investigation and laboratory work of the group. The duration of each should be of a minimum of six months and the training course should include visits to European ports with similar problems to those being studied. It is recommended that one engineer be appointed from the African area and one from Asia. UNDP Pre-Investment Survey of Fishing Harbours Project (India) should be permitted also to provide one civil engineer fellowship paid for from the UNDP project budget.

5.3 Supplies and Equipment

Full use should be made of existing equipments in laboratories and in Government service, but a provisional sum should be provided to cover the purchase or hireage of special equipments not normally or readily available.

5.4 Miscellaneous Costs

These would include the fees for research studies for hydraulic model and prototype experiments.

5.5 Other costs would include a project contingency and publication costs and would also include the Government services itemized in paragraph 6.

5.6 The table of costs in US $ would approximate as follows:

	Travel/p.d.	Salary	Misc.	Total
1. Personnel	7,500	10,500	2,000	20,000
2. Fellowships	4,000	4,500	1,000	9,500
3. Equipment	-	-	3,500	3,500
4. Misc. costs, including site model investigations, etc.			30,000	30,000
5. Contingencies			5,000	5,000
6. Publication costs, 1,000 copies (3 languages)				8,000
				76,000

6. ESTIMATED COUNTERPART CONTRIBUTION

Not applicable, except that additional services would have to be provided by the Government of Denmark for meetings, discussions and investigations, e.g.:

Office accommodation
Local transportation
Stationery/Secretarial
Laboratory services
Library services
Expenses of local engineers and other personnel called to meet the Group for discussions.

It is estimated that a maximum of $ 4,000 would cover these expenses.

APPENDIX 2.1.2

FAO DEPARTMENT OF FISHERIES

Summary Record of Meeting
with Members of the Danish Delegation
Held on 29 January 1970

Present:

Danish Delegation	- Mr. F.B. Howitz, Head of the Department of Technical Cooperation with Developing Countries, Danish Ministry of Foreign Affairs
	- Mr. H.J. Kristensen, Acting Counsellor, Ministry of Agriculture
	- Mr. L. Bjornskov, Secretary
Area Service Division	- Dr. A.E.G. Markham
Department of Fisheries	- Mr. C.H. Clay Dr. H.D.R. Iyengar Mr. P. Schjefte

Mr. Howitz gave a brief account of the extent of the Danish Aid programme. In the fiscal year 1969 it had earmarked about 9 million dollars; this would be increased to 10 million dollars after 1 April 1970, and to about 11 million dollars by 1 April 1971.

The Danish Government had entered into an agreement with FAO for a Cooperative Development programme. Other international agencies are showing a keen interest in entering into a similar arrangement.

The projects submitted by the Department of Fisheries were reviewed.

In the second programme prepared in 1969 for operation in 1970, the Department of Fisheries had submitted six projects and none of these had been accepted for assistance in 1970. It was explained that this was purely for budgetary reasons, and some of the projects could be included for the third programme (1970). These six projects were reviewed at the meeting.

Item 5. Studies on the problems associated with the construction of small fishery harbours and landing places on difficult coasts of developing countries.

Mr. Howitz suggested that this project should provide more details, particularly in relation to how Danish experience and expertise might be used. As it was an interesting one, it should be included in the third programme for 1971 to be submitted in 1970.

APPENDIX 2.1.3

PROJECT PROPOSAL FOR FAO/DENMARK COOPERATIVE PROGRAMME: SUBMITTED 1970

I. TITLE: FAO/Denmark Cooperative Regional Project: Problems of Small Fishery Harbours and Landing Places on Difficult Coasts

RECIPIENT COUNTRY: Asia and Far East Regional project, with specific works in India, Malaysia and Thailand and application of results for the benefit of all member countries

NATIONAL MINISTRY, INSTITUTION ETC., INVOLVED: The host country will be Denmark, where national engineer institutes will take an active part in the project. However, site works will be conducted principally in India (in conjunction with INDIA 55 Pre-investment Survey of Fishing Harbours Project) and minor site observations and tests in Malaysia and Thailand

DONOR CONTRIBUTION: $ 165 000 (approx.)

DURATION: 12 months approx. with possible extension to second-stage investigation of the more extensive problems

II. BACKGROUND:

THE PROBLEM:

In many parts of the developing world the fishery industries, especially at the less mechanized levels which generally form very substantial sections of the industries, are being seriously hindered by lack of suitable sites for ports, landing places and their essential associated shore facilities. The principal reason can in general be attributed to the unsuitable nature of the coastline and its inability to provide conditions for the construction of a moderate-sized facility, without fear of destruction by forces of nature such as swell, heavy littoral drift, river currents and sedimentation, etc. No real effort has as yet been put into the solution of these problems for the small fishery harbour, though much work has been done in the larger commercial harbour sector. It is the intention of this project first of all to gather existing information and to document the scientific experimental results already available and then to point to the studies and practical work that might lead to a solution of the various existing problems. The final stages will consist of practical investigation of the problems and the preparation of recommendations for, as far as possible, general application to world industry.

RELATED PROJECTS:

There are a number of important areas in the world where extremely difficult coastal conditions exist. India, Malaysia, West Africa and parts of South America are well-known in this respect. However, a major pre-investment project - UNDP(SF): India 55, Pre-investment Survey of Fishing Harbours Project, is in operation in India and work is now in hand and will continue until 1972 on the production of detailed plans for a number of fishery harbours, including a high percentage with difficult coastal conditions. It is therefore strongly recommended that the site elements of the project now proposed should be mutually associated with the India 55 project.

GOVERNMENT INTEREST AND SUPPORT:

There is no doubt that the Government of India will favour the location of some of the work in India, and any fellowships to nationals of that country which may result from the studies.

III. PURPOSE:

In brief, the main objectives of the project would be:

(a) to itemize and study the difficulties foreseen in the development of fishery landing and port facilities on coasts with various natural hazards;

(b) to categorize the various alternative systems that might, under the various circumstances, provide adequate economic services for the fishery industry;

(c) to determine the best methods of overcoming the hazards, initial and recurring, to enable the various possible solutions considered to be effective.

(d) to inform member countries of the results of the investigations and studies and pass the project recommendations for their consideration in future fishery port development.

IV. DESCRIPTION AND WORK PLAN:

1. LOCATION AND PHASING:

The host Government should provide facilities for the initial discussions and a major portion of the recurring discussions. All laboratory and special engineering non-site studies should also be located in Denmark. The most suited location would be in a Government or Central Engineering Institute. However, it is anticipated that a number of relatively short but more widespread discussions covering many aspects of fisheries, e.g. naval architect, gear specialist, fishery economists, etc., would be more suitably located in Rome.

Thereafter, as determined by the project requirements, within budgetary limitations, and in association with the India 55 (Pre-investment Survey of Fishing Harbours Project with Headquarters at Bangalore) the site work, surveys and investigations should be conducted in India, with minor site works in Thailand and Malaysia.

2. RESPONSIBLE OFFICIAL

Mr. W.J. Guckian, Chief, Fishery Engineering Section, Fishing Vessels and Engineering Branch, Fishery Industries Division, will be the FAO Co-Director - a civil engineer with considerable experience in the planning of small harbours on difficult coasts (e.g. surf, littoral drift hazards, etc.).

3. GENERAL NATURE OF PERSONNEL

FAO will request periodic specialist consultant visits to the project to take part in the discussions. These, together with other FAO specialists at Rome HQ or Projects, will be available to the project for discussions and advice on any aspect of the project operation within their competence. A schedule of these consultants is given below, with FAO current recommendations for appointments.

The Government of Denmark will be expected to nominate and provide all other project staff, working technicians, laboratory and institute facilities and project materials, and other accommodations, administration, clerical assistance etc., required. Especially the Government of Denmark will be expected to make available as required by the Project, adequate Consultants time to advise on particular problems as they arise or are identified.

4. THE POTENTIAL ROLE OF VOLUNTEERS AND/OR ASSOCIATE EXPERTS

An FAO/Netherlands Civil Engineer Associate Expert (due for recruitment in 1970) and other associate experts of various disciplines may be available to serve on the project from time to time (e.g. economist, naval architect, etc.).

5. COUNTERPART CONTRIBUTION

The project costs will - apart from FAO Regular Programme staff salaries and office accommodation costs for meetings and discussions held in Rome, which will be borne by the FAO, and the Associate Experts' salaries and part expenses which will be borne by the Government agency concerned - be paid by Denmark Cooperation Agency.

6. PREPARATORY MISSIONS

A preparatory discussion should take place in Denmark between Government and FAO officials to arrange a plan of operations and work programme. A short visit to the countries concerned in the region should also be made to study the facilities available at each centre and at the India 55 Special Fund Pre-investment Survey of Fishing Harbours Project headquarters.

V. ESTIMATED COSTS

A. DONOR CONTRIBUTION

1.	Personnel			161 600	US $ + lease charges on local Institutes and Services
	FAO Nominations (including all allowances)				
	FAO Regular Programme staff component	4 m/m	P4		7 667
	Consultants				
	Coastal (Professor P. Bruun) (Danish national)	2 m/m	(ADG level)		6 000 approx.
	" (Professor E. Nielsen) (Danish national)	0 5 m/m	(D1 level)		1 250
	Fishery port and planning				
	(Mr. E.W.H. Gifford, U.K.)	1 m/m	(D1 level)		
	} 3 m/m				
	(Mr. H.A. Delap, Ireland)	2 m/m	(D1 level)		7 500
	Other miscellaneous FAO Staff and Consultants	3 m/m	(P5 level)		6 750
	Government of Denmark Personnel				
	Co-director (part-time) (D1)	3 m/m			7 500
	1 Engineer (P5)	3 m/m			6 750
	2 Engineers (P4)	6 m/m			11 500
	Other miscellaneous Engineers, Technicians and clerical staff as required				20 000
2.	Supplies and Equipment				
	All equipment used on the project should, in general, be leased from the Government of Denmark, or FAO, or the India SF projects at an agreed rate. A special provisional sum of $ 3 500 should, however, be provided for the purchase of specific items not otherwise available to the project.				3 500 (and unspecified lease charges)
3.	Travel and Transportation				
	(See also note in para. V.A, 4 and 5 below) Travel (International - provisional sum)				20 000
4.	Contractual Services				
5.	Grants and Subsidies				
	Work carried out by the India 55 project on behalf of proposed project is estimated to total $ 30 000 over a period of up to two months. This will cover local travel in India and all technical and clerical services and equipments, in addition to FAO staff, contractors' staff and Government staff salaries and allowances				30 000.

6.	Project Servicing Costs	$
	14 % of total	17 976
	6 % Insurance, miscellaneous expenditures	7 704
7.	Preparatory Mission (Copenhagen and Asia)	
	2/3 persons, including travel	6 500
B.	COUNTERPART COSTS	
	Project	
	See item V.A. (4 and 5) for India Project costs reimbursement	
	Regional Costs	
	Provision of clerical and local technical assistance, services etc., for Bangkok and Malaysia to be provided through the FAO Regional Office, Bangkok	1 000

APPENDIX 2.2.1

PROJECT REQUEST FOR FAO/NORAD COOPERATIVE PROGRAMME: SUBMITTED 1970

I. TITLE: Problems of small fishery harbours and landing places on difficult coasts

RECIPIENT COUNTRY: Asia and Far East Region, with specific works in India, Malaysia and Thailand and application of results for the benefit of all member countries

NATIONAL INSTITUTION INVOLVED: The host country will be Norway, where the Technical University of Norway should take an active part in the project. However, site works will be conducted principally in India (in conjunction with UNDP/SF INDIA 55 Pre-Investment Survey of Fishing Harbours Project) and minor site observations and tests in Malaysia and Thailand

DONOR CONTRIBUTION: US $ 132 400

DURATION: 12 months approximately, with possible extension to second-stage investigation of the more extensive problems

II. BACKGROUND:

(a) THE PROBLEM

In many parts of the developing world the fishery industries, especially at the less mechanized levels which generally form very substantial sections of the industries, are being seriously hindered by lack of suitable sites for ports, landing places and their essential associated shore facilities. The principal reason can in general be attributed to the unsuitable nature of the coastline and its inability to provide conditions for the construction of a moderate-sized facility, without fear of destruction by forces of nature such as swell, heavy littoral drift, river currents and sedimentation etc. No real effort has as yet been put into the solution of these problems for the small fishery harbour, though much work has been done in the larger commercial harbour sector. It is the intention of this project first of all to gather existing information and to document the scientific experimental results already available and then to point to the studies and practical work that might lead to a solution of the various existing problems. The final stages will consist of practical investigations of the problems and the preparation of recommendations for, as far as possible, general application to world industry.

(b) RELATED PROJECTS:

There are a number of important areas in the world where extremely difficult coastal conditions exist. India, Malaysia, West Africa and parts of South America are well known in this respect However, a major pre-investment project (UNDP(SF): India 55, Pre-investment Survey of Fishing Harbours Project) is in operation in India and work is now in hand and will continue until 1972 on the production of detailed plans for a number of fishery harbours, including a high percentage with difficult coastal conditions. It is therefore strongly recommended that the site elements of the project now proposed should be mutually associated with the India 55 project.

(c) GOVERNMENT INTEREST AND SUPPORT:

There is no doubt that the Government of India will favour the location of some of the work in India, and any fellowships to nationals of that country which may result from the studies.

III. PURPOSE

The main objectives of the project would be:

(a) To itemize and study the difficulties foreseen in the development of fishery landing and port facilities on coasts with various natural hazards;

(b) To categorize the alternative systems that might, under the various circumstances, provide adequate economic services for the fishery industry;

(c) To determine the best methods of overcoming the hazards, initial and recurring, to enable the various possible solutions considered to be effective.

(d) To inform member countries of the results of the investigations and studies and pass the project recommendations for their consideration in future fishery port development.

IV. DESCRIPTION AND WORK PLAN

1. Location and phasing

The Government of Norway should provide facilities for the initial discussions and a major portion of the recurring discussions. All laboratory and special engineering non-site studies should also be located in Norway. The most suited location would be in a Government or Central Engineering Institute. However, it is anticipated that a number of relatively short but more widespread discussions covering many aspects of fisheries, e.g., naval architect, gear specialist, fishery economists, etc., would be more suitably located in Rome at FAO Headquarters.

Thereafter, as determined by the project requirements, within budgetary limitations, and in association with the India 55 Pre-Investment Survey of Fishing Harbours Project, with Headquarters at Bangalore, the site work, surveys and investigations should be conducted in India, with minor site works in Thailand and Malaysia.

2. Responsible Official

Mr. W.J. Guckian, Chief, Fishery Harbours Section, Fishing Vessels and Engineering Branch, Fishery Industries Division, will be the FAO Co-Director of the project, with the Host Government nominating a Co-Director - a civil engineer with considerable experience in the planning of small harbours on difficult coasts (e.g. surf, littoral drift hazards, etc.).

3. General nature of personnel

FAO will request periodic specialist consultant visits to the project to take part in the discussions. These, together with other FAO specialists at Rome HQ or Projects, will be available to the project for discussions and advice on any aspect of the project operation within their competence. A schedule of these consultants is given below, with FAO current recommendations for appointments.

The Government of Norway will be expected to nominate and provide all other project staff, working technicians, laboratory and institute facilities and project materials, and other accommodations, administration, clerical assistance, etc., required. Especially the Government of Norway will be expected to make available as required by the Project, adequate consultant time to advise on particular problems as they arise or are identified.

4. The potential role of volunteers and/or Associate Experts

An FAO/Netherlands Civil Engineer Associate Expert (due for recruitment in 1970) and other associate experts of various disciplines may be available to serve on the project from time to time (e.g., economist, naval architect, etc.). To assist the FAO Co-Director, an Associate Expert (Civil Engineer) from Norway would be desirable.

5. Preparatory missions

A preparatory discussion should take place in Norway between Government and FAO officials to arrange a plan of operations and work programme. A short visit to the countries concerned in the region should also be made to study the facilities available at each centre and at the India 55 Special Fund Pre-Investment Survey of Fishing Harbours Project headquarters at Bangalore.

V. ESTIMATED COST

A. Donor Contribution

1. Project

(i) Personnel services: FAO Nominations

	US $
Consultant (coastal)	
Professor P. Bruun, Technical University of Norway (D1 - 4 m/m)	10 000
Consultants (Fishery port and planning)	
Mr. E.W.H. Gifford, UK (D1 - 2 m/m)	5 000
Mr. H.A. Delap, Ireland (D1 - 2 m/m)	5 000
Other consultants (P5 - 4 m/m)	9 000
NORAD Nominations	
Co-Director (part-time)	not costed
1 Engineer (P5 - 3 m/m)	not costed
Miscellaneous Engineers, technicians and clerical staff	not costed

(ii) Supplies and Equipment: 3 500 (and unspecified lease charges)

All equipment used on the project should, in general, be leased from the Government of Norway, or FAO, or the India SF projects at an agreed rate. A special provisional sum of $ 3 500 should, however, be provided for the purchase of specific items not otherwise available to the project.

(iii) Travel and transportation:

For international travel of consultants, FAO staff, NORAD appointed staff - provisional estimate	20 000
Associate Expert	4 000

(iv) Contractual Services: 30 000

Work carried out by the India 55 project on behalf of proposed project is estimated to total $ 30 000 over a period of up to two months. This will cover local travel in India and all technical and clerical services and equipments, in addition to FAO staff, contractors' staff and Government staff salaries and allowances.

Cost of institutional services provided inside Norway	not costed
Clerical services to be provided through FAO on field locations	1 000
Miscellaneous costs	5 000
(v) Project Servicing Cost: 14 %	12 390
Total	100 890

(Costs of Norwegian personnel and services not included)

2. Preparatory Mission

		US $
(i)	Consultants fees (2 persons)	3 500
(ii)	Travel (including FAO Co-Director and consultants) to Norway and India	3 000
(iii)	Servicing costs	900
	Total	7 400

B. Counterpart Contribution

Not applicable.

N.B. It is estimated that NORAD-financed expenditure for staffing and laboratory fees and other miscellaneous expenses would total an additional US $ 100 000.

APPENDIX 2.2.2

FAO DEPARTMENT OF FISHERIES

Summary Record of Meeting with Members of the
Norwegian Agency for International Development (NORAD)
Held on Tuesday, 8 December 1970 at 1000 h
in the Queen Juliana Room (B-324)

Present: NORAD Delegation
- Mr. P. Bog, Director, Planning Department
- Mr. R. Hultin, Director, Field Projects Department
- Mr. O. Lindstad, Senior Planning Officer, Planning Department

Together with several FAO Department of Fisheries Officers

Amongst several agenda items, the following is of interest:

TF/NOR-35. Problems of Small Fishery Harbours and Landing Places on Difficult Coasts

The objectives of this project are to itemize and study the difficulties foreseen in the development of fishery landing and port facilities, and to inform governments on results of investigations and recommend programmes for fishery port development. The studies are to be carried out in India and Thailand. NORAD was informed that Malaysia has not supported the project idea.

In this project also associate expert component has been removed and the present total amount of assistance requested is $ 100 890. NORAD wished to know how far this project was linked with the ongoing SF fisheries harbour project in India. It was explained that this project was supplementary to the activities of the SF harbour project and that the studies would be carried out in close cooperation with this project. There was considerable interest in India and it was felt that the opportunities for conducting field studies in India and Thailand were bright. Regarding the costing of the project, NORAD wished to have some indication of their share for engineers and other technical as well as clerical staff. It was clarified that the NORAD commitment may be another $ 100 000, which means the total allotment from NORAD for this project would be a little over $ 200 000. Mr. Markham wished to have copies of the correspondence on this project with the Indian project for his records.

It was suggested that in order to elaborate on this project, it would be advisable to invite Professor Bruun of the Technical University of Norway to Rome for a briefing of about one week and an amount of $ 500 would be required for this, and it was agreed that this might be funded from the General Fund, which NORAD has with FAO. An alternative proposal after the meeting by Mr. Hultin was that he approach Bruun directly in Norway, to get the estimated costs of Norwegian participation.

APPENDIX 2.2.3

PROJECT IDEA FOR FAO/COUNTRY COOPERATIVE PROGRAMME: SUBMITTED SEPTEMBER 1974

I. TITLE: Beach Landing Unit

RECIPIENT COUNTRY: India

DONOR CONTRIBUTION: US $ 250 000

DURATION: 1½ years plus two review visits at one year intervals

II. BACKGROUND:

Indian fishery development is suffering through lack of adequate landing places and handling centres. Especially on the east coast, but also on many sections of the west coast, there is a lack of suitable conditions to permit the establishment of an all-weather facility. Various alternatives must be tried to provide facilities near to the principal fishery villages on these coasts. In some cases, open jetties could provide a facility for up to nine months' operation, but in other cases less costly alternatives must be examined.

III. and IV. PURPOSE AND DESCRIPTION:

The project would provide a system of "cross-beach" landing and launching which could cater in moderate swell conditions for motorized vessels up to 10 G.T. by means of rollers, winch systems, etc. The project could also lead to improvements in vessel design and to the conduct of experiments with towing gear and anchorages to provide the most acceptable and safe conditions in a number of carefully selected locations.

V. ESTIMATED COSTS:

		US $
Personnel Service		
1 Project Manager/Civil Engineer	24 m/m	70 000
1 Mechanical Engineer	12 m/m	30 000
1 Boatbuilder	2 m/m	30 000
Consultants	6 m/m	
Miscellaneous expenses		10 000
Contractual services, including equipment and materials		100 000
Preparatory Mission		10 000
	TOTAL	250 000

Counterpart contribution will include local staff, labour, locally available materials and transport.

APPENDIX 2.2.4

PROJECT IDEA FOR FAO/NORAD COOPERATIVE PROGRAMME (6th): SUBMITTED 1974

I. TITLE: Development of Extreme Shallow Draft Fishing Vessels

RECIPIENT COUNTRIES: Global application of results

DONOR CONTRIBUTION: US $ 300 000

DURATION: Two years

II. BACKGROUND:

Natural coastal conditions in many developing countries constitute an important restraint to the development of coastal and inshore fisheries with modern, efficient, mechanized vessels, inasmuch as the provision of landing facilities is often only possible at prohibitive cost. This is particularly true in coastal areas with pronounced littoral drift and where the entrance to sheltered areas, such as river mouths, is blocked by sand bars allowing the use of vessels with extremely shallow draft only.

Presently known and used types of fishing vessels generally have relatively deep draughts which prohibit their use under operating conditions outlined above. Serious consideration needs to be given to the development of low draft hull forms suitable for fishing operations in such areas; the economic feasibility of operating such vessels at possibly less than optimal efficiency, in conjunction with simple landing facilities at much lower investment and maintenance cost as compared to deep water ports, requires detailed investigation.

The subject is already receiving attention in a senior student thesis at the Technical University of Norway under the guidance of Professor E. Dahle of the Research Institute of Fishing Technology; this thesis, while expected to provide preliminary results, is limited in scope but will form the basis for extensive further investigations by this project in close collaboration with the Research Institute of Fishery Technology and the Technical University of Norway.

III. PROJECT OUTLINE:

The project would include consultant work in design and model testing of alternative solutions, including seaworthiness tests, behaviour in breaking waves (surf),full-scale fishing trials within the framework of an ongoing small-scale fishery development project (e.g. in the CECAF area), as well as economic analysis of operations under differing conditions and compared to deep draft vessels including different costs in harbours and associated facilities. Funds will be provided under the project for the publication of a comprehensive report in the main languages (E/F/S).

The project will provide technological information of immediate importance and applicability in many countries and will greatly assist small-scale fisheries development projects expected to be in operation within the broader context of the FAO/UNDP regional fisheries projects (IOP, SCSP, CECAF).

IV. COST ESTIMATE:

The order of cost is estimated at about US $ 300 000, of which about equal parts would be earmarked for research and investigations on the one hand and practical testing on the other.

APPENDIX 3.1

LANDING ON DIFFICULT COASTS

A Proposal for a Development Project

by E.W.H. Gifford, B.Sc.(Eng.), C.Eng, FICE FIStructe

1. INTRODUCTION

The present trend in world fishing policy as outlined by FOA appears to be twofold:

1.1 To stimulate the development of hitherto untapped sources as revealed by recent surveys and reports.

1.2 To encourage the artisanal fishermen by improving techniques, gear, marketing and distribution.

To combine these two aims it will be necessary to develop existing fisheries without moving the local population.

One of the reasons why some subsistence fisheries have not developed is that the coast on which they work are exposed to the weather. Boats and gear are often lost in the surf so that the fisherman is reluctant to invest in expensive equipment.

If artisanal fisheries are to be improved and the untapped sources to be developed by indigenous fishing communities, then ways must be found of working safely from existing beaches, either by providing shelter or improving the boats and sometimes a combination of both.

Our interest in this subject goes back many years, but was strengthened by the discussion at the FAO Bremen Conference on Fishing Ports and Markets in 1968. At this Conference, many delegates asked civil engineers to devise ways of providing safe, cheap harbours on open coasts. Indeed, the Conference resolution called upon FAO to initiate research into this subject.

2. THE PROBLEM

The problem is not so much one of technical possibility but of cost in relation to benefit. Most open coasts have substantial beaches, the material of which is moved up and down the coast by wave action. This littoral drift can be very large, over one million tons per year in some cases.

The problem of constructing a harbour on such a coast is not only the cost of the protection works themselves, which can be very large, but the cost of dredging out the material deposited by the littoral drift. The use of special draining works, groins etc., only postpones the build-up of sand and are themselves an additional burden of cost.

Pumping this material across the entrance is an answer in certain circumstances, but is again expensive in plant and fuel.

Such high maintenance costs can be borne by large commercial ports such as Madras, Liverpool and Lagos, but not by fishermen.

If the littoral drift problem is not present, the construction of an artificial harbour on an open coast can be expensive and, if the capital cost is not borne elsewhere, can be too much for a new industry.

But many important, or potentially important, fishing areas - West Africa, Eastern India, Yemen, have such coasts and so a solution must be found if small and medium sized vessels are to be used.

3.1 Floating breakwaters. These appear to have been successful for short seas, but the size required to control long ocean swells appears to be very great.

3.2 Permeable breakwaters. These offer a possible solution as they are considerably cheaper than full breakwaters, and need not interfere with littoral drift. An investigation could be made of a breakwater built from widely spread timber piles in such a way as to reduce the worst surf without attempting to eliminate it.

3.3 Development of beach boats. The development of large beach boats and catamarans in conjunction with modern winches, tractors and rollers appears likely to be fruitful, perhaps in conjunction with 3.2.

4. EXISTING BEACHING METHODS

There are many existing beaching methods that could, by improvement in hull design and by the application of greater forces for launching and recovery, be extended to handle larger vessels in heavier seas than at present.

Of the many methods in use at present these seem most capable of adoption and improvement: The Portuguese saviero, the Yorkshire coble and the Jutland outhaul.

The problem with all monohull systems lies not only in avoiding capsize whilst passing through the surf but also the prevention of the boat broaching to when the bow touches the beach.

4.1 The saviero uses the warp of its seine net to steady it during its run through the surf and its shallow draft and flat, rockered bottom to keep stability on the beach.

It is hauled clear of the surf with oxen which, yoked to a long pole, are also used to launch the boat off into deep water.

4.2 The coble is landed stern first so that its deep bow grounds at the same time as its twin stern skegs; this "three-point landing" simultaneously maintains stability and prevents broaching. The coble is recovered and launched with a two-wheeled trolley and a tractor.

4.3 The Jutland outhaul consists of a powerful winch operating a wire rope through a block secured to permanent anchors in deep water. The boat is of relatively conventional Scandinavian form. There are no special methods of avoiding broaching and instability.

All the above methods are used for boats up to twenty tons displacement, but it appears that only the saviero is used in strong surf.

5. THE PROPOSED SOLUTION

5.1 The problem of broaching and stability on a beach can be met in a monohull approaching a beach bow-first if the hull is flat-bottomed. The bow can be run up over a roller wider than the beam of the vessel, and if the boat is equipped with twin stern skegs which ground as the bow lifts over the roller, the winch rope is then fixed on and the boat hauled out over the roller-path. This method would be limited to moderate surf for vessels of not less than 16 m.

For hauling out and launching, a waterproofed tractor would be used as this is more flexible in operation than the fixed outhaul. It would be fitted with 12 m. poles to thrust the launched boat well into the surf.

5.2 For beaches with heavier surf or where smaller boats are needed, the catamaran appears to offer a solution. Its twin hulls give it a high resistance to capsizing in the surf, and great stability when grounding and being handled on the beach.

The launching and recovery principles are similar to those described in 5.1.

A series of successful tests on small catamaran models have been made in towing and wave tanks and a half-sized model has almost completed testing. This 20-ft boat at ¼-ton displacement has a speed of 7½ knots with 8.5 SHP. It is a very good sea-boat and handles well even in breaking overfalls. It is extremely manoeuvrable under both engines. With only one engine running in one hull it will turn against that engine in four boat lengths.

There is a slight disadvantage in the catamaran in that there is an increase in skin friction drag but this is more than offset by its surf-riding capability. It also provides a fine area of working deck. If speeds above 1.4 L are required, then the reduced wave-making at these speeds makes speeds of 2 L quite attainable with only linear increases in power.

CATFISH I

(COPYRIGHT : E.W.H. GIFFORD & PARTNERS)

Photo No. II/A Landing at bar beach - Lagos

(COPYRIGHT: E.W.H. GIFFORD & PARTNERS)

Photo No. II/B Typical surf during trials at Lagos

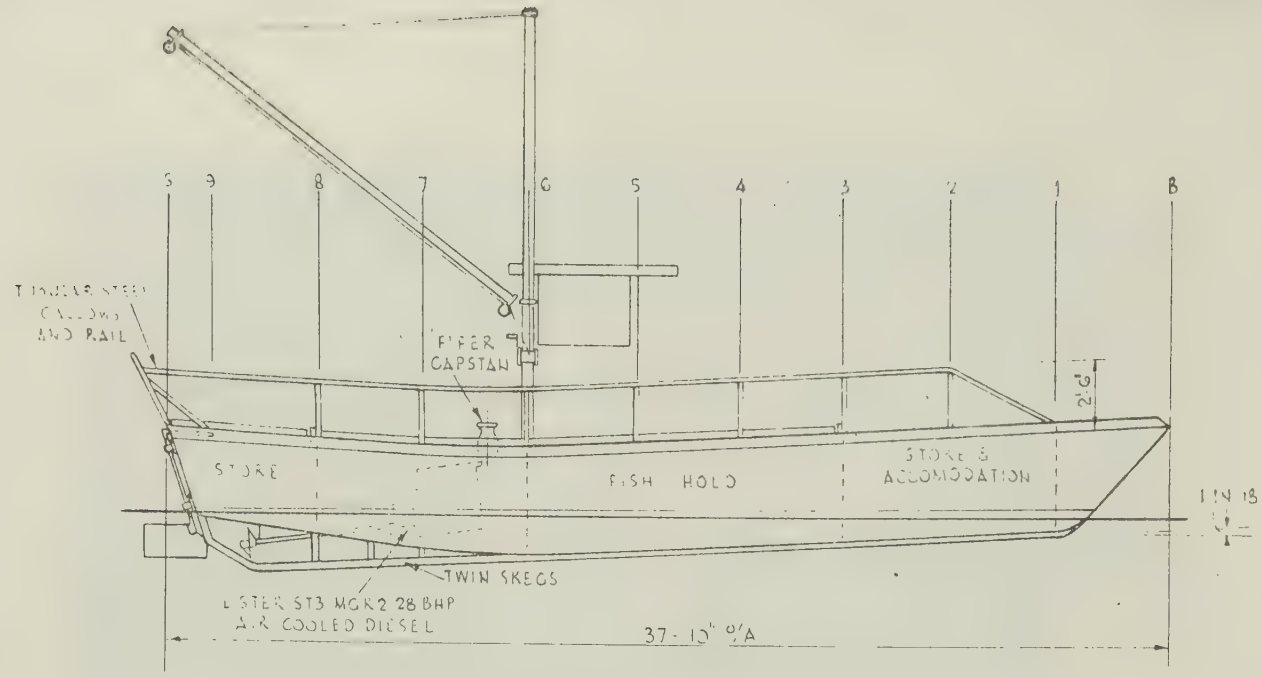
CATFISH II

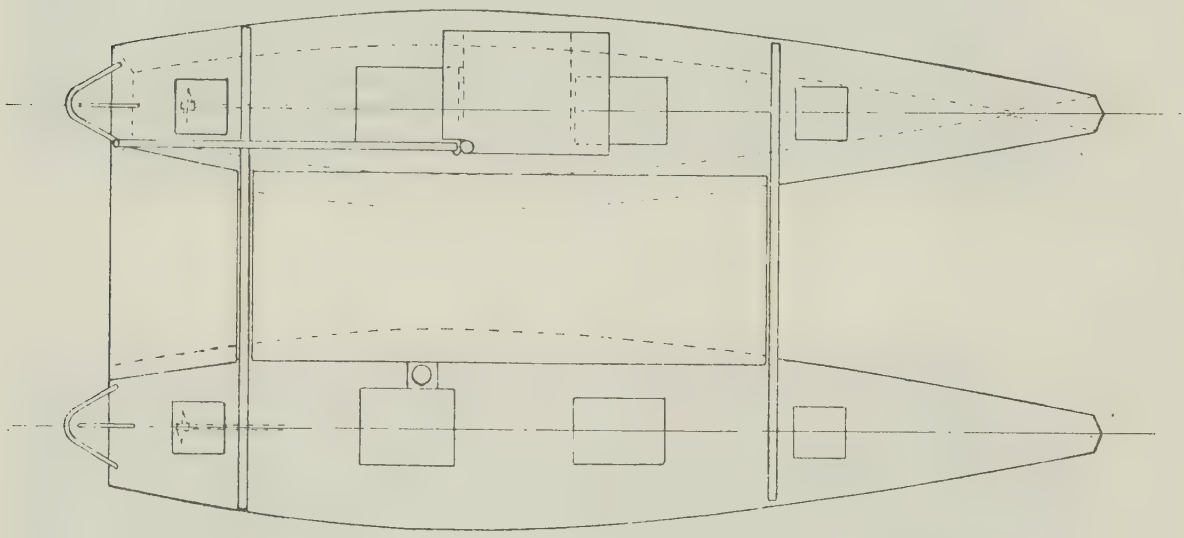
(COPYRIGHT : E.W.H. GIFFORD & PARTNERS)

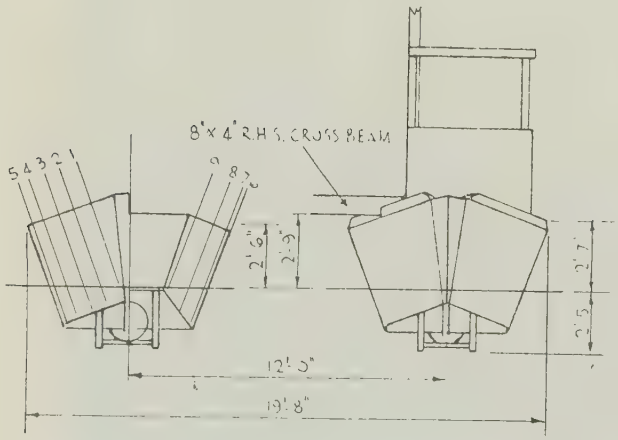
Photo No. 12/A

(COPYRIGHT : E.W.H. GIFFORD & PARTNERS)

Photo No. 12/B







PERFORMANCE:

1. FISH AND ICE CAPACITY 6 TONS
2. SPEED 8 KNOTS
3. SURF HEIGHT 8 FEET APPROX.
4. CALM WATER FERRY CAPACITY 10 TONS

CATFISH 40 SURF BEACH FISHING BOAT

DESIGNER : E.W.H. GIFFORD

DRAWING No. 1

The boat has been designed for simple construction on the Banks dory principle by any reasonably competent wood worker.

6. NEXT STAGE OF DEVELOPMENT

It is proposed that this project should be completed as follows:

6.1 Complete surf tests on half-scale model.

6.2 Build a full-size prototype and test in field conditions together with tractor, rollers and turntable.

6.3 Build two half-scale models of monohulls and test in British waters.

6.4 Build one full-size prototype of one monohull design and test in field conditions.

6.5 Make desk study of possible breakwater types.

6.6 Make small-scale model tests of permeable breakwater if this is thought practicable.

7. LOCATION OF FINAL TESTS

It has been suggested that Ghana would be a suitable development area as it has a heavy surf problem with a developing fishery industry with capable boatmen to assist with trials.

8. FINANCE OF DEVELOPMENT PROJECT

It is proposed that the cost of the remaining part of the project, which is estimated at £40 000, should be financed by Overseas Development Administration.

APPENDIX 3.2

SHORT SUMMARY OF CERTAIN OBSERVATIONS: E.W.H. GIFFORD, JULY 1974

Experience gained in the last two years of trials is that the surf and littoral drift problem can probably be divided into three main categories depending on the magnitude of the normal surf and the frequency and warning of storms.

(i) Severe surf conditions (surf regularly between 1-2 metres high) with storms of short warning

Artificial protection is likely to be inadequate or ecoromic for the storm situation and so the boats must be capable of landing in heavy surf and being hauled right clear of the sea. For this purpose the multi-hull of approximately 12 metres length with winch and out-haul appears to be the most likely solution.

(ii) Moderate surf (below 1 metre) but with storms of short warning

Multi-hulls would be suitable for this purpose also but if the fishing grounds are near to the landing point then light monohulls of 9-10 metres could be handled with winches and outhauls. Experiments with permeable wave screens should be made to reduce the storm surf to allow safe landing under these conditions and thus extend the range of fishing.

(iii) Moderate surf when storms are rare and with good warning

Monohulls as in (ii) are likely to be suitable or tee jetties for deeper craft if storm shelter is available within reasonable distances. Multi-hulls could be used if they were in other respects desirable.

APPENDIX 4.1

EXCERPT FROM "INSHORE FISHERY PROJECT" BY E.W.H. GIFFORD AND PARTNERS

PURPOSE OF PROJECT

The purpose of the project was to test the handling characteristics, with particular reference to beach landing, of a prototype catamaran designed by E.W.H. Gifford. The vessel was to be tested under various surf conditions in Nigeria and local fishermen trained to operate it. Subject to the satisfactory completion of these trials, the Western Nigerian Department of Fisheries will test the fishing potential of the vessel in areas where the vessel could operate if introduced commercially.

BACKGROUND

At a Conference organized by the FAO in Bremen on Fishing Ports and Markets in September 1968, many delegates from underdeveloped countries emphasized the need to improve the landing facilities on exposed coasts. It appears that the majority of fishermen throughout the world, probably many millions in number, fish from such coasts and if their fishing capacity is to be increased then they must either be given the ability to work more powerful vessels from the beach or they must move to areas where port facilities can easily be created.

DETAILS OF VESSEL (Reference Drawing No. 1)

The hulls of the prototype combination fishing vessel "Catfish" were built with aluminium bottoms and sides and timber decks and wheelhouse. Two Lister SR3 air-cooled engines of 19.5 b.h.p. were installed, each driving a 16 in. diameter bronze propeller through a 2 to 1 reduction reversing gear-box. One engine also drives the Fifer vertical capstan, giving a half-ton pull for handling fishing gear and for hauling the boat off through the surf. The engines give a speed of 6.9 knots and a bollard pull of approximately half a ton. This has been found suitable for pulling a trawl of 35 ft head-rope at a speed of approximately 2 knots.

PRELIMINARY CONCLUSIONS

The tests proved that the boat can work off a beach through medium surf, and indicate that it should be capable of surmounting much more severe conditions.

The fishing trials showed that the craft is a capable small-trawler and gill-netter and that it's efficiency is probably high in this respect (although only limited measured fishing trials were made).

The senior members of the fishing community of Aiyetoro, which is regarded as the most experienced group of indigenous fishermen in Nigeria, were very enthusiastic about the boat and expressed their intention of building to this design.

It can, therefore, be said that this first stage of trials has been successfully completed and that the next stages can be tackled.

RECOMMENDATIONS

1. The craft should be worked intensively as a fishing-craft by the Aiyetoro Community under the overall supervision of the Western State Fisheries. Their tests should include measured fishing, giving comparison of catching capabilities, under similar conditions, of canoes, "Catfish" and the Aiyetoro trawlers. These figures would enable an approximate economic assessment to be made.

2. A winch should be set up alongside the central canoe station at Aiyetoro so that hauling out trials can be made using various types of skids and out-hauls. There is a hand-operated 2-ton capacity winch aboard "Catfish" at present which could be used for these trials, although a more powerful motor driven version will be more desirable.

3. Representatives of the consulting firm should be invited to return to Aiyetoro to continue testing the craft in the more severe weather conditions prevailing in August and September.

4. A wooden prototype should be built in England to test the strength of this cheaper form of construction, to finalize hauling-out methods and to incorporate various minor modifications that have been desirable as a result of the trials, these include:

(a) provision of 30 b.h.p. Lister ST3 engines in place of the 19.5 b. Lister SR3's.

(b) provision of properly ventilated accommodation in the forward compartment;

(c) insulation of fish hold;

(d) single instead of double skegs;

(e) flush bridge deck;

(f) sliding windows in wheelhouse;

(g) small double-drum trawling winch.

Approximate UK costs of the above recommendations		£
1.	Fishing trials	Nil
2.	Hand winch	Nil
	Motor winch	1 000
3.	Second visit to Aiyetoro	1 000
4.	Wooden prototype complete, hauling out winch, trials in UK, shipping to Nigeria and trials there	12 500
		£ 14 500

FURTHER CONCLUSIONS 1974

Following a year's experience of the prototype craft in Nigeria, the principle of the catamaran surf beach trawler has been accepted by the Nigerian Government and they are to purchase the latest version of the craft from UK and then will make arrangements for manufacturing these locally. They are planning to set up a training school on the coast in conjunction with the fishing community which has been using "Catfish I" to train the fishermen of adjacent communities in the use of the craft. At a subsequent visit to Ghana it was clear that this coast is ideally suited to this particular application, and a group of private Ghanians have agreed to buy a craft with a view to setting up manufacture after trials.

Despite the success of this first craft, however, it should be understood that it is only a prototype and that because of the novelty of this type of boat design and recovery methods involved, a good deal of research should still be done in development and perfection of the techniques.

APPENDIX 4.2

NIGERIAN INSHORE FISHING PROJECT RESEARCH SCHEME R2747
SUMMARY REPORT OF VISIT TO AIYETORO, NIGERIA, IN AUGUST 1974

The fisheries visit commenced with a meeting with Mr. O. Elliott, the Principal Fisheries Officer of the Western State Government at Ibadan. At this meeting Mr. Elliott and his deputy, Mr. Z.A. Adesanya, expressed their satisfaction with "Catfish I", and handed over a copy of their first report (Appendix I).

On the 7 August, Mr. E.W.H. Gifford arrived at Aiyetoro.

On the 8 August, "Catfish I" was at sea all day, presumably fishing, and could not be visited.

On the 9 August a short trial trip was made, in the company of Mr. Z.A. Adesanya. It was evident that certain maintenance was urgently required and this was set in hand.

On 13 August a fishing trial took place in very rough weather. The maximum height of breakers in the mouth of the Aiyetoro creek was in excess of 8 feet, but these were successfully climbed by "Catfish I" without any solid water coming aboard. There were no canoes out fishing during the last six days of the visit because of the severe weather, and it is understood that such conditions can sometimes last for a month. The trawl was shot at 11.45. The net is made from small (1½ in.) mesh of heavy cotton twine it is probable that a lighter net of larger mesh would be more suitable.

The engines were found to be running at about two-thirds maximum revolutions because the Morse control gear had been dismantled after damage. Use of full power and a lighter net would increase fishing potential, which would be further improved by the larger engines to be fitted in later craft. Nevertheless, despite the very bad sea state and the reduced power, a number of medium sole and prawn, in addition to medium croaker and "miscellaneous" fish, were caught. The boat ran back into the creek through the large breakers without great difficulty despite the fixed speed setting of the engines.

A list of maintenance items was prepared (Appendix II) and handed over to the Community and it is understood that this work is now in hand.

The visit ended on 14 August.

Craft Performance

(i) Fishing Potential

Examination of the first reports by the Western State Fisheries and that of the Aiyetoro Community of 4 June 1974 (Appendix III) records catches of value between N16 and N42 per day. The boat is recorded as having fished some 24 days in the months of March and April. Discussion with a local fisherman using a monohull trawler (not a beach boat) of equivalent power and with a similar trawl indicates an earning capacity of N80 per 24 hours fishing. With improved gear and greater depths this could be exceeded.

An approximate calculation by E.W.H. Gifford (Appendix IV) shows that the craft requires an average income of N38/day for 250 days/year to be economically viable. It would appear that this is attainable.

It has been agreed between the State Fisheries Department and the Community that there will be close liaison on future detailed recording of catch, fishing time, depths, gear and weather.

(ii) Seaworthiness

This is now proved beyond doubt. The craft negotiates heavy surf without difficulty and provides a steady fishing platform under quite severe conditions.

(iii) Mechanical

The enforced lay up of the vessel for practically a full year whilst administrative matters were settled, has clouded the issue of mechanical reliability. The atmosphere of this coast is severely corrosive and there can be little doubt that the cylinders were corroded as during most of this time the engines could not be turned. This appeared to have damaged the piston rings which were replaced by the Community's own engineers. At some time the Morse control cables were also damaged. This in turn resulted in lack of variable speed control and loss of power. Nevertheless, apart from some slight smoking in the starboard engine, the engines themselves are starting easily and running well and smoothly. When the speed control was held open they appeared to give full power. There has been heavy wear in the Tufnol bearings in the propeller shaft brackets, possibly caused by the silt in the sea. This in turn caused heavy vibration which produced some local fatigue cracking in the aluminium bottom plates adjacent to the propeller shaft brackets.

Otherwise the hulls, engines and gear were sound.

Report on Final Meeting on 23 August 1974 with the Western State Fisheries Department, the Aiyetoro Community and the British High Commission

The Meeting was held in the Secretariat at Ibadan

Present:	Mr. O. Elliott Mr. Z.A. Adesanya Mr. Aderomu	- Western State Fisheries
	Mr. S.O. Authority	- Aiyetoro Community
	Mr. D. Amey	- British High Commission
	Mr. E.W.H. Gifford	- E.W.H. Gifford and Partners

At this meeting Mr. E.W.H. Gifford reported the results of his visit, namely that the craft design had proved successful for its purpose as a fishing boat on a surf beaten coast. He suggested that it would benefit the fishing community of Okitipupa district if the problem of the remoteness of the coast could be overcome to enable closer collaboration between Government officials and the Aiyetoro Community fishermen.

Mr. Elliott stated that his department had already come to the following decisions:

1. They would set up a base at Aiyetoro with a resident fisheries officer, store and rest house.

2. They will run instruction courses, in association with the Aiyetoro Community, for local fishermen from the adjacent villages, to familiarise them with both the "Catfish" and the Authority/Gifford monohull depending on their particular location.

3. They will buy "Catfish II" during this financial year, for which there is provision, and set up a base at, or near, Araromi.

The hope was expressed that ODM would grant financial aid for the setting up of (3) and for a master fisherman to assist in (2) and (3) for a period of about six months.

Conclusions

1. The craft is seaworthy and provides a good fishing platform. It is capable of fishing throughout the rough weather season at times when the canoes cannot go to sea. As these periods of rough weather can last for several weeks, this capability is of great importance.

2. The fishing potential of "Catfish I" is shown to be economically viable even under the adverse conditions described. With greater power, better gear and longer fishing periods the income could be substantially increased.

Recommendations

1. That the "Catfish 40" design be accepted and further boats built.

2. That the principle of the training school at Aiyetoro be supported.

3. That an application for technical assistance from Western State Government be favourably considered by ODM.

APPENDIX 5

FURTHER PROJECT IDEA PREPARED 1974 FOR SUBMISSION TO DONOR AGENCIES
PROJECT OUTLINE FOR SPECIFIC APPLICATION ON EAST COASTLINE OF INDIA

1. Locations

A number of small-scale fishery landing places and port developments on the coastlines of India have been identified and prepared in detail by the FAO/UNDP India Fishery Harbours Project recently terminated and approved for a limited extension funding by SIDA.

Taking at random two typical projects on the Eastern Coast of India - Madras (Tamil Nadu) state - those of Mallipatnam and Chinnamuttom show many of the difficult characteristics described in the body of this report. Their locations are indicated on attached map, and developments proposed are indicated on the attached perspective sketches.

2. Local Conditions

All along the East Coast of India heavy littoral drift occurs, up to 2,000,000 tons of material moving per annum with this maximum figure on stretches of the Northern coastal region (at Madras it is known to average about 1,000,000 tons per annum and has caused great difficulties in accretion and erosion over almost the past 100 years). The monsoon season brings with it almost 9 months of S.E. waves and swell of a moderate character and the remaining three months of gales and destructive typhoons from the N.E. or E. These conditions make the construction and operation of small facilities most difficult.

3. Fishery Elements

Most of the fisheries in these regions are based on small canoe-type catamarans, some mechanized and at a number of more favoured spots mechanized craft up to the 32 ft class may be utilized. Vessels over this size require the establishment of more sophisticated landing and berthing facilities and these are very few on the East Coast, where Kakinada and Visakhapatnam are probably the leading centres.

4. FAO/UNDP Project. Recommended Developments

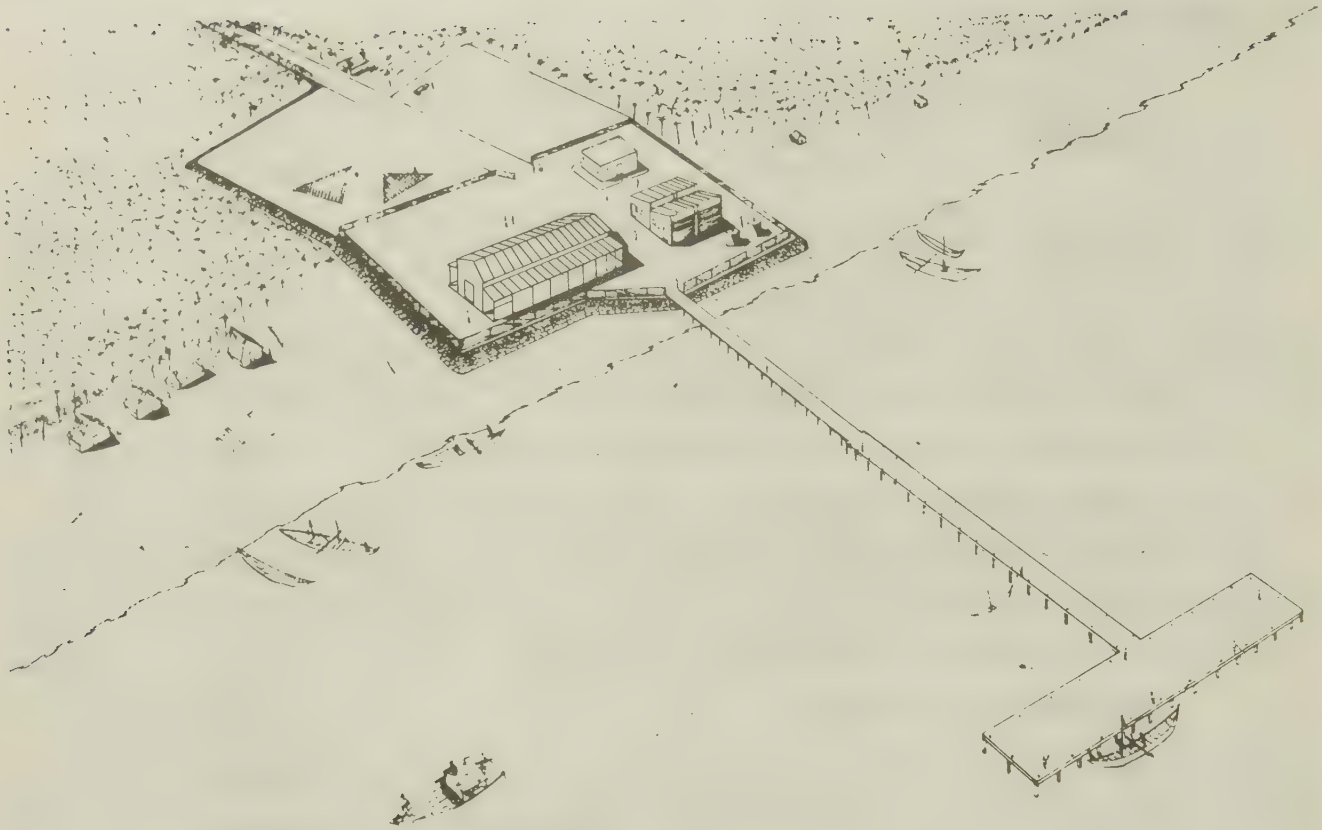
The FAO/UNDP project has prepared projections for the future expansion of the industry at both Mallipatnam and Chinnamuttom, and has recommended and prepared in detail the facilities required, indicated the types and numbers of vessels and also the desirable and necessary shore installation to serve the fleets and landings. The cost estimates are detailed below.

5. Suggested Additional Items

To make these developments fully integrated, a number of additional elements should be added. These would include improvement in gear and fishery methods, vessel improvements to suit the local conditions, further desirable equipment and organizational provisions to cater for the handling, processing and distribution and marketing of the increased landings. In addition, an element of training should be included which should be mainly of an "on-the-job" nature, with practical demonstrations and adequate work supervision.

6. Possible Cost Elements

			US $
6.1	FAO/UNDP Project Detailed Estimates		
	Mallipatnam	Landing facilities	150 000
		Shore facilities	100 000
		Vessels	500 000
	Chinnamuttom	Landing facilities	1 500 000
		Shore facilities	400 000
		Vessels	1 100 000
	Physical and Price Contingencies 1973/74 (20 %)		750 000
6.2	Miscellaneous Improvements Gear and Methods (2 centres)		100 000
	Training Facilities (2 centres)		100 000
	Materials, Gear and Equipment (2 centres)		150 000
6.3	Technical Assistance		250 000
6.4	Local Counterpart Facilities and Staff (2 centres)		450 000
	Servicing Charges 15 % (say)		832 000
			6 382 500
		Total (say)	6 500 000



GOVERNMENT OF INDIA

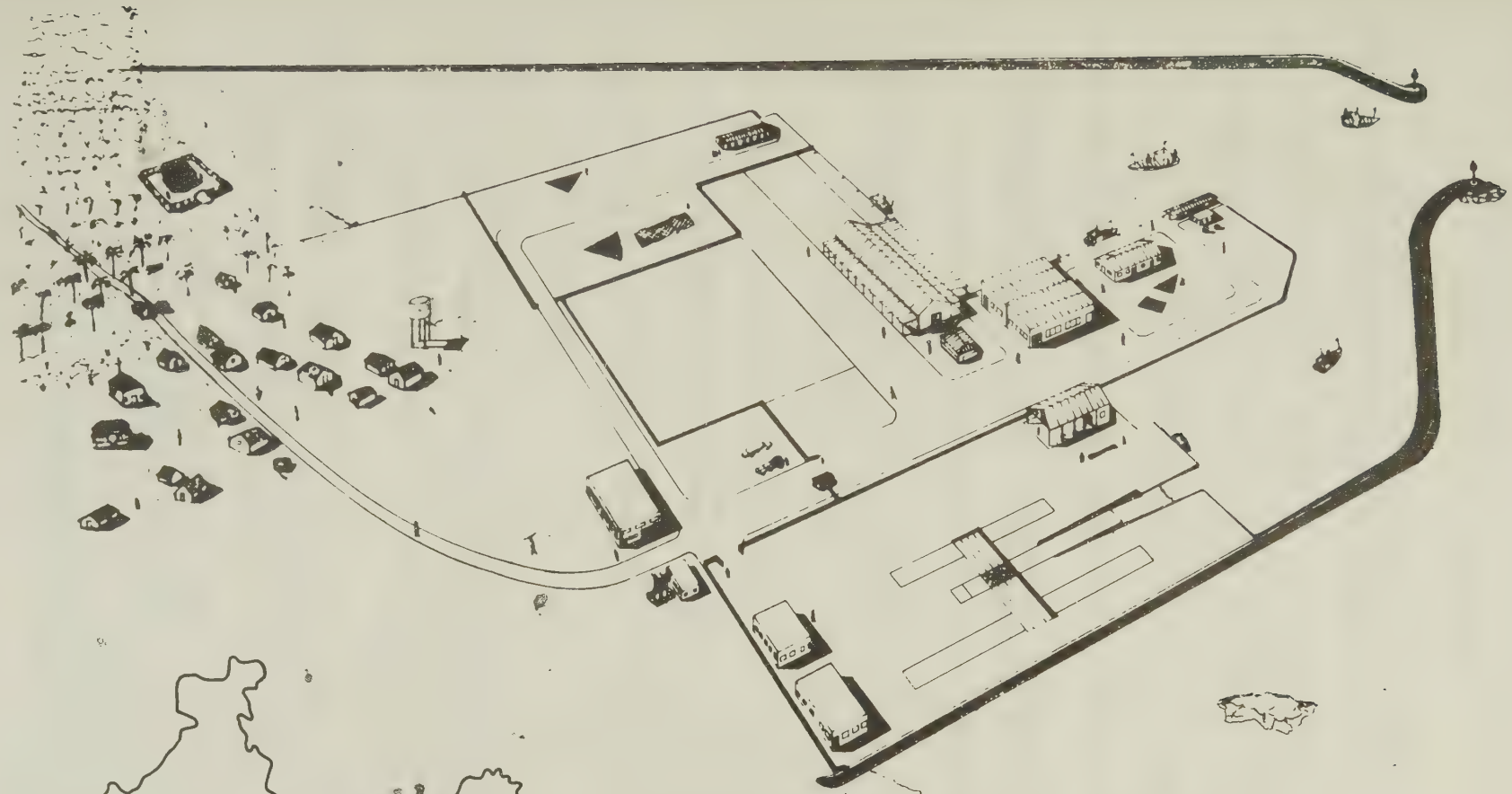
UNDP

PRE-INVESTMENT SURVEY OF FISHING HARBOURS PROJECT

F A O FIAT PANIS

MALLIPATNAM			
PROPOSED FISHING HARBOUR PERSPECTIVE			
SCALE NOT TO SCALE			
DATE : 3·4·72		57	13

DRAWING No. 2



CHINNAMUTTOM

GOVERNMENT OF INDIA

UNDP

PRE INVESTMENT SURVEY OF FISHING HARBOURS PROJECT

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CHINNAMUTTOM		
PROPOSED FISHING HARBOUR PERSPECTIVE		
SCALE	NOT TO SCALE	
DATE	10-5-72	55 28

DRAWING No. 3

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